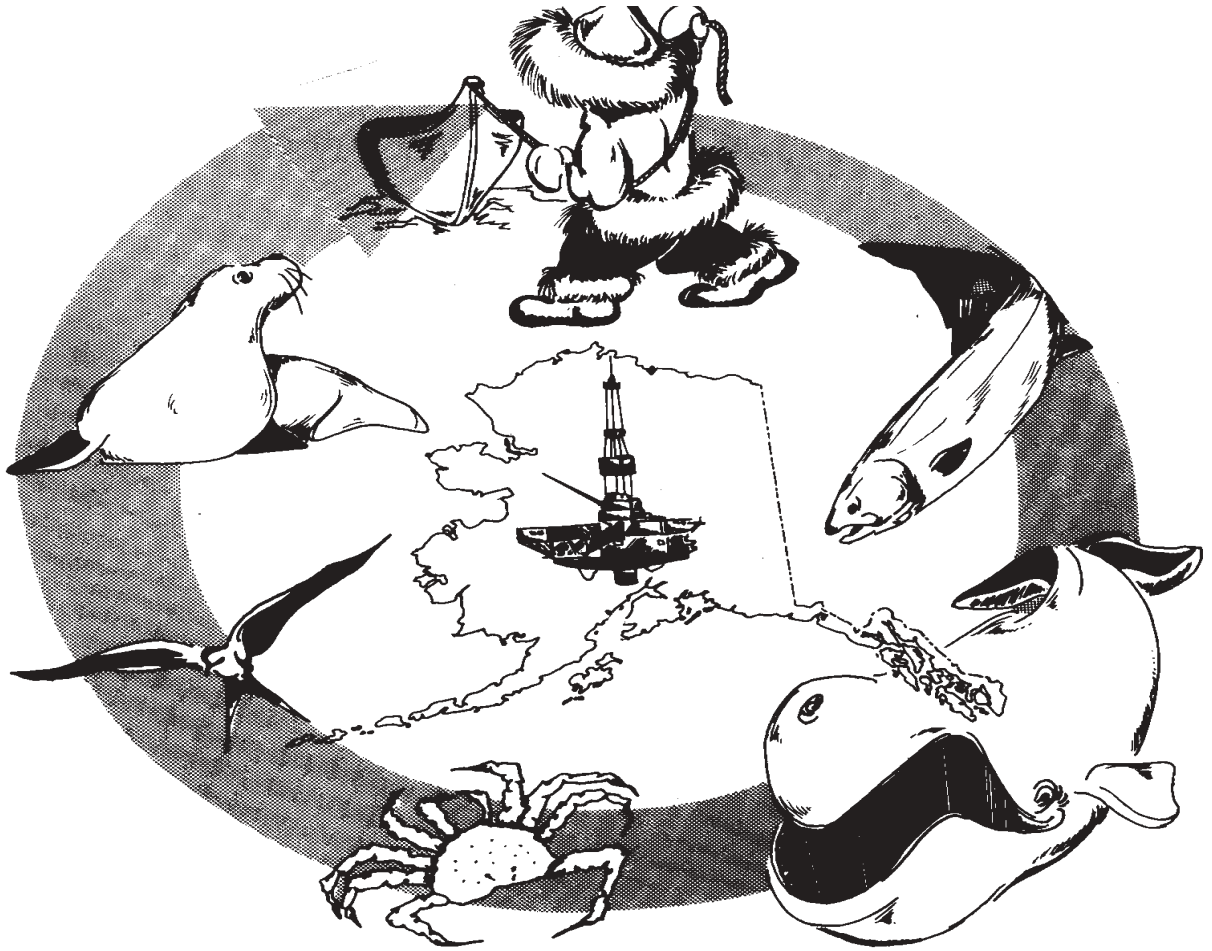
Alaska Outer Continental Shelf Region

Alaska Annual Studies Plan Final FY 2003



MMS U.S. Department of the Interior
Minerals Management Service
Alaska Outer Continental Shelf Region

July 2002

United States Department of the Interior

MINERALS MANAGEMENT SERVICE
Alaska Outer Continental Shelf Region
949 East 36th Avenue, 3rd Floor
Anchorage, Alaska 99508-4363

Dear Stakeholder:

In October 2001 we sent an *Annual Studies Plan FY 2003* to stakeholders and requested comments and suggestions. We appreciate the comments and ideas for new studies sent in response. We have reviewed and incorporated those that meet MMS mission and decision needs.

Enclosed is the *Final Annual Studies Plan FY 2003* (June 2002) for your information.

Thank you for your participation in our process. If you have any questions , please contact Mr. Tim Holder, ASP Coordinator, at 907-271-6625.

Sincerely,

Cleve Cowles, Ph.D.
Chief, Environmental Studies Section

Prepared by
U.S. Department of the Interior
Minerals Management Service
Alaska Outer Continental Shelf Region
949 East 36th Avenue, Room 308
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June 2002

For copies of this document, please contact Tim Holder at (907) 271-6625 or by email, Tim.Holder@mms.gov or access at http://www.mms.gov/alaska (click on Environmental Studies Section).

The inclusion of studies proposed in this document does not constitute a commitment by the U.S. Department of the Interior, Minerals Management Service, to conduct or fund any or all of the studies. The scope of the studies is subject to change prior to initiation of any work.

Any use of trade names is for description purposes only and does not constitute endorsement of these products by the Minerals Management Service.

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Protected Species

Social Science and Economics

Multidisciplinary

Physical Oceanography

Fate and Effects

Biology

Section 2.3 Profiles of Studies Proposed for FY 2004 (Continued)

Protected Species

Social Science and Economics

Multidisciplinary

ACRONYMS, INITIALISMS, ABBREVIATIONS, AND SYMBOLS

ABL	Auke Bay Laboratory
ADCP	acoustic Doppler current profiler
ADF&G	Alaska Department of Fish and Game
AEPS	Arctic Environmental Protection Strategy
AEWC	Arctic Eskimo Whaling Commission
AFTC	Alaska Frozen-Tissue Collection AK - Alaska
AK	Alaska
AMAP	Arctic Monitoring and Assessment Program
AMMTAP	Alaska Marine Mammal Tissue Archival Project
ANCSA	Alaska Native Claims Settlement Act
ANIMIDA	Arctic Nearshore Impact Monitoring in Development Area
ANWR	Alaska National Wildlife Refuge
ASP	Annual Studies Plan (Alaska OCS Region)
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BRD	Biological Resources Division (USGS)
C	Celsius
CAFF	Conservation of Arctic Flora and Fauna [working group]
CD-ROM	Compact Disk Read Only Memory
C.F.R.	Code of Federal Regulations
CI	Confidence Interval
CIRCAC	Cook Inlet Regional Citizens'Advisory Council
cm	centimeter
CMI	Coastal Marine Institute
CORIS	Coastal Offshore Resource Information System
COZOIL	Coastal and Surf Zone Oil-Spill-Transport Model
CP	Comprehensive Program
CTD	conductivity-temperature-depth [measuring device]
DOI	Department of Interior
DPP	Development and Production Plan
EA	Environmental Assessment
EAS	Environmental Assessment Section
ECMRWF	European Center for Medium Range Weather Forecasting
Ed.	Editor
Eds.	Editors
e.g.	for example
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESP	Environmental Studies Program
EVOS	*Exxon Valdez* Oil Spill
FEAM	Fisheries Economic Assessment Model
Fig.	Figure
FJMC	Fisheries Joint Management Committee
FLIR	Forward Looking Infra-Red (FLIR) Imagery
FNOC	Fleet Numerical Oceanography Center
FY	Fiscal Year

GIS	Geographical Information Systems
GPS	Global Positioning System
GSA	General Services Administration
GUI	Graphical User Interface
Hg	Mercury
IA	Interagency Agreement
IBR	Information Base Review
i.e.	that is
IMPLAN	Impact Analysis for Planning
IR	infrared
ITM	Information Transfer Meeting
IUM	Information Update Meeting
kHz	kiloHertz
km	kilometer
m	meter
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
NAB	Northwest Arctic Borough
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Center
NORM	normally occurring radioactive materials
NPDES	National Pollutant Discharge Elimination System
NPR-A	National Petroleum Reserve-Alaska
NRC	National Research Council
NSB	North Slope Borough
NSF	National Science Foundation
NSP	National Strategic Plan (MMS)
NTIS	National Technical Information Service
OCS	Outer Continental Shelf
OCSEAP	Outer Continental Shelf Environmental Assessment Program
OCSLA	Outer Continental Shelf Lands Act
OCSLAA	Outer Continental Shelf Lands Act as Amended
OMPA	Office of Marine Pollution Assessment
OSRA	Oil-Spill-Risk Analysis
OWM	Oil-Weathering Model
PAH	polycyclic aromatic hydrocarbons
PC	personal computer
PDF	portable document file
ppm	parts per million
RFIC	Request for Information and Comments
SDE	Spatial database engine
SPED	Sub-sea Physical Environmental Database
SPEM	Semi-Spectral Primitive Equation Model
SNOMED	Systematized Nomenclature of Medicine

TAG	Technical Assessment Group
TAR	Technology Assessment and Research (TAR) Program
TBD	To Be Determined
TIMS	Technical Information Management System
TR	Technical Report
UAA	University of Alaska Anchorage
UAF	University of Alaska Fairbanks
U.S.	United States
USDOC	U.S. Department of Commerce
USDOD	U.S. Department of Defense
USDOI	U.S. Department of the Interior
USFWS	.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
U.S.S.R.	Union of Soviet Socialist Republics

WOSM World Oil-Spill Model

Symbols

>	greater than
<	less than

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SECTION 1. Programmatic Overview

Section 1.1 Introduction to the Region

Background

The Alaska Environmental Studies Program (ESP) was initiated by the U.S. Department of the Interior (USDOI) in 1974 in response to the Federal Governmentís decision to propose areas of Alaska for offshore gas and oil development. Federal management of the Outer Continental Shelf (OCS) is guided by several legislative acts. Regulations implementing the OCS Lands Act (OCSLA) of 1953, as amended in 1978 (OCSLAA), designated the Bureau of Land Management (BLM) as the administrative agency responsible for leasing and the U.S. Geological Survey (USGS) as responsible for supervising classification, evaluation, development, and production of mineral resources on submerged Federal lands. The offices under BLM and USGS responsible for offshore leasing were reorganized as the Minerals Management Service (MMS) in 1982. One of the goals of the OCSLA was to provide for protection of the environment concomitant with mineral-resource development. The OCSLA requires the Secretary of the Interior to conduct environmental studies to obtain information pertinent to sound leasing decisions as well as to monitor the human, marine, and coastal environments (OCSLAA, 1978 [Public Law 95-372, Section 20]). Also, the National Environmental Policy Act (NEPA) of 1969 requires that all Federal Agencies use a systematic, interdisciplinary approach that will ensure the integrated use of the natural and social sciences in any planning and decision making that may have effects on the environment. Federal laws impose additional requirements on the offshore leasing process, including the Coastal Zone Management Act; Federal Water Pollution Control Act Amendments; Marine Mammal Protection Act (MMPA); Endangered Species Act (ESA); and Marine Protection, Research, and Sanctuaries Act.

The purpose of the ESP is to define information needs and implement studies to assist in predicting, projecting, assessing, and managing potential effects on the human, marine, and coastal environments of the OCS and coastal areas that may be affected by gas and oil development. Lease-management decisions are enhanced when current, pertinent, and timely information is available. To attain program goals, data on specific environmental, social, and economic concerns arising from offshore leasing are required. The ESP then monitors any effects during and after oil exploration and development. It is the largest, single-agency, mission-oriented, marine-studies program in the Federal Government. Since the ESP inception through Fiscal Year (FY) 1999, more than $677 million have been spent on the ESP nationally. More than $265 million of this amount has funded Alaskan studies in 15 planning areas in the Arctic, Bering Sea, and Gulf of Alaska Subregions (see Fig. 1).

Early in the development of the program, the focus was on obtaining baseline information on the vast biological resources and physical characteristics of the Alaskan environment for prelease decision making. These studies included biological surveys of marine species, basic oceanography and meteorology, and geologic and sea-ice phenomena. As a broader base of information was established, it became possible to focus on more topical studies in smaller areas

Fig. 1 Alaska Planning Areas

Note:
The maritime boundaries and limits shown, as well as the divisions between the planning areas, are for initial planning purposes only and do not prejudice or affect United States jurisdiction in any way.

to answer specific questions and fill identified information needs. In addition, a number of generic studies were initiated on the potential effects of oil contamination on biological resources and on the probable transport and dispersion of oil that might be spilled in the marine environment.

The use of computer-modeling techniques has been implemented to aid in the assessment of potential oil-spill and other pollutant risks to the environment and to key species such as fur seals, sea otters, and endangered whales. Modeling also has been used in the ecosystem studies, especially where extrapolation to other areas seemed warranted.

As more disciplinary data were collected and analyzed, the importance of taking an integrated, interdisciplinary look at complete ecosystems in sensitive areas became apparent. During this time, the leasing program was maturing. As a number of sales were held and exploration activities began, postlease studies to monitor the possible effects of gas and oil activities on the environment and resources of these areas were initiated. The ESP provides information for development of the 5-year leasing schedule and for prelease- and lease-related decisions, and develops monitoring information necessary for postlease management.

As studies information has been amassed, improved focus has required greater integration of various scientific disciplines. The MMS has initiated Synthesis Meetings, Information Transfer Meetings (ITMís), and Information Update Meetings (IUMís) to gather maximum expertise and assess the status of existing information, and to plan the best possible approach to a study within the constraints of time and resources. As the MMS and other Federal and State agencies collect more pertinent information, the MMS funds studies to search and evaluate existing literature and data prior to initiation of field efforts. This prevents duplication of effort and saves valuable resources by focusing later study efforts on the areas of greatest information need and highest usefulness to MMS decision needs.

As noted by the National Research Council (NRC, 1994), the MMS Alaska ESP is ìextensive, substantive and high quality.î However, the Alaska ESP has been challenged to meet its mission in an increasingly conservative fiscal environment. For example, the ESPís funding declined significantly since 1986. Despite this challenging situation, the ESP, at the national level and in all the regions including Alaska, remains committed to attaining quality environmental and socioeconomic information.

The *Final Alaska Annual Studies Plan FY 2003* (prepared in June 2002) complements and reinforces the *Environmental Studies Program National Strategic Plan (NSP) 1998-2002*. The NSP has several broad themes, which include the following:

1. Monitoring Marine Environments
2. Seismic and Acoustic Impacts
3. Understanding Social and Economic Impacts
4. Oil-Spill Research Techniques
5. Efficient and Effective Information Management

To be responsive to changing programs, issues, and offshore technologies, the MMS Alaska Region proposes new studies and innovates in conjunction with the NSP themes. Due to the great differences existing between Alaska environments and other OCS areas, the uniqueness of the environment and related issues in Alaska underscores the need to be flexible in planning and implementation of needed studies.

Issues To Be Addressed

At each step of the offshore leasing and development process, a variety of potential issues or resource-use conflicts may be encountered. There are numerous issues and multiple-use conflicts related to offshore oil and gas development in Alaska. This section ìIssues To Be Addressedî forms a framework for the section on ìIdentification of Information Needs.î As a result of issues characterized by uncertain information we identify specific Information Needs. Two questions are fundamental:

1. What is the expected change in the human, marine, and coastal environment due to offshore development and, therefore, expected change in benefits to humans from affected natural resources?

2. Can undesirable change be minimized by mitigating measures?

Environmental studies are often critical to answering both types of questions; and are expected to provide information useful to decision making in both regards. Currently the Alaska ESP has primary focus on upcoming developments, possible lease sales, and existing leases in the Beaufort Sea, Cook Inlet, Chukchi/Hope Basin, and Norton Basin Planning Area.

Current offshore oil- and gas-related issues for which studies are proposed to address in the Beaufort Sea, Chukchi/Hope Basin, and Norton Basin Planning Area include but are not limited to:

- What long term changes in heavy metal and hydrocarbon levels may occur near Beaufort Sea development prospects such as Liberty or regionally along the Beaufort Sea coast?

- What role will currents play in distribution of contaminants near development prospects?

- What long term changes in underwater industrial noise will occur and how might such noise propagate near development prospects relative to ambient noise levels?

- What are the effects of seismic exploration on the availability of bowhead whales for subsistence and other important marine species such as seals or fish?

- What changes might occur in habitat, distribution, abundance, and movement of key, potentially sensitive species such as bowhead whales, waterfowl, polar bears, other marine mammals, or fish?

- What interactions between human activities and the physical environment have affected these potentially sensitive species?

- What is the importance of future proposed or potential lease sale areas to feeding bowhead whales and overall bowhead population nutritional requirements?

- What potential contaminants are occurring in various sensitive species?

- What changes might occur in socioeconomics and subsistence lifestyles of coastal Alaska communities?

- What are current subsistence harvest patterns and what changes might occur in key social indicators as a result of offshore exploration and development?

- What changes might occur in sensitive benthic communities such as the Stefansson Sound ìBoulder Patch,î other Beaufort Sea kelp communities or fish habitats?

- What refinements are there to our knowledge of major oceanographic and meteorological processes and how do they influence the human, marine, and coastal environment?

- How do we improve our projection of the fate of potential oil spills?

- If oil is spilled in broken ice, what will its fate be and how might it be cleaned up?

- What effects might pipeline construction have on nearby marine communities or organisms such as fish?

- How can we better integrate traditional knowledge of local residents into scientific processes and studies related to the Alaska ESP?

Similarly, there are a number of offshore oil- and gas-related issues that environmental studies in the Cook Inlet Region propose to address, including but not limited to:

- What long-term changes in heavy metal and hydrocarbon contamination have occurred in water and sediment quality?

- What refinements are there to our knowledge of major oceanographic and meteorological processes in Cook Inlet and Shelikof Strait and how do they influence the human, marine, and coastal environment?

- How do we improve our prediction of the fate of potential oil spills?

- What long term changes related to past or future activities have occurred in marine food webs, especially regarding key fish, seabirds and sensitive marine mammals?

- What are the effects of offshore oil and gas exploration or development on important socioeconomic activities such as commercial fishing or existing community infrastructures?

- What are the near term and long term effects on key economic activities such as sport fisheries?

- What are current subsistence harvest patterns and what changes might occur in key social indicators as a result of offshore exploration and development?

- How can we better integrate traditional knowledge of local residents into scientific processes and studies related to the Alaska ESP?

Participatory Planning

As proposals for exploration and development continue to evolve, Alaskaís coastal communities on the Beaufort Sea are expecting increased involvement in project reviews and decisions that may affect their subsistence lifestyle. Since the people of Alaskaís remote Arctic communities rely so heavily on subsistence resources of the marine environment, they are especially concerned about industrial activities that may directly or indirectly affect hunting success or the habitats of the species important to subsistence. They have an opportunity to comment on proposed and ongoing studies, especially those focused on the interactions of human activities and the natural environment.

Traditional knowledge has been incorporated into specific study planning, fieldwork, and interpretation of results over the years of the ESP. It is a continuing process to synthesize information from many projects into a broader, multi disciplinary view of research results. Past efforts such as MMS ITMís have helped us guide the design of future studies toward a more encompassing involvement of traditional information with scientific activities and results. Also of particular importance is the sharing of information between social and economic disciplines and other scientific fields. The process of melding traditional knowledge with other MMS studies varies from project to project, but the outcome of better information for decision making is a common goal.

Over the years, the MMS ESP has involved Alaskans and others in its research planning and execution in a number of ways. Solicitation of comments on the Alaska Annual Studies Plans (ASPís) has been practiced for years. The MMS ESP has sought out and included the knowledge of coastal community residents in planning. Another key source of input is discussion and advice on the ASP by the MMS Scientific Committee, which occurs on an annual basis. Other public involvement, such as participation on study project-management-review boards or scientific-

review boards of certain studies, has assisted the MMS. In all MMS field-oriented studies, researchers coordinate directly with local communities to discuss their plans, seek advice, and assure that interested people learn about the project and its results. Recently, the MMS has incorporated traditional knowledge of Alaskan residents directly in the preparation of its EISís and decision documents.

The MMS sponsored a Social and Economic Planning Conference in 1999. MMS Scientific Committee members, university professors, consultants, and MMS staff participated. For the Alaska Region discussions of major issues focused on impact assessment, monitoring key indicators, traditional knowledge, and stakeholder participation. The Alaska Region has taken the results of this Conference into consideration in preparing study profiles for proposed studies and scopes of work for studies to be contracted. Further information on this conference is available at http://www.mms.gov/eppd/socecon/conference.htm.

Coordination and Cooperation

The Alaska ESP through its day-to-day operations and ASP process:

- Coordinate plans and ongoing studies with other ongoing programs and research to assure optimal studies management and to manage budget resources efficiently.
- Enhance utilization of existing information.
- Share logistics and equipment.
- Enhance team approaches to interdisciplinary projects.

Currently a major portion of the program is conducted on a cooperative basis. In 1993, to take advantage of scientific expertise at the local level in addressing issues of mutual concern, the MMS developed the Coastal Marine Institute (CMI). Under an initial 5-year Cooperative Agreement with CMI, the MMS committed $1,000,000 per year with a dollar-for-dollar match arrangement of Federal and State funds. The University of Alaska Fairbanks (UAF) School of Fisheries and Ocean Sciences, nationally recognized for its coastal and marine expertise, administers the Alaskan CMI. The cooperative agreement was renewed for another 5 years in 1998. The MMS anticipates discussing an additional ìFramework Issueî with the CMI: the examination of selected species of algae and invertebrates living on OCS oil industry platforms for potential bio-compounds. Genetic and taxonomic investigations combined with screening tests would be used to identify active bio-compounds such as: cancer inhibitors, biochemical enzymes for medical testing, and commercial bio-adhesives. In addition to funding CMI scientific research, a substantial portion of the MMS contribution supports education in Alaska by funding tuition and travel for UAF graduate-student research related to CMI projects.

The Alaska ESP also coordinates with other U.S. and local research entities such as the National Science Foundation, Arctic Research Commission, USGS- Biological Resources Division, *Exxon Valdez* Oil Spill Trustee Council research program, North Slope Borough Department of Wildlife Management, National Research Council, Polar Research Board, Cook Inlet Regional Citizens Advisory Council, and industry programs. Additional international linkages with the Russian Academy of Sciences Institutes in Magadan and Vladivostok have also been established.

Recently, the U.S. and seven other Arctic nations voluntarily agreed to cooperate on an Arctic Environmental Protection Strategy (AEPS) which has evolved into the formation of the Arctic Council in 1996. The Alaska ESP maintains contacts and coordination with Arctic Council activities, such as the Arctic Monitoring and Assessment Program (AMAP) and Conservation of Arctic Flora and Fauna (CAFF). The ESP provides information to these working groups through review of reports and plans, and helps to inform participants of available information sponsored by MMS. Further, specific studies that can coordinate and integrate with working group activities are identified and beneficial linkages facilitated.

Section 1.2 Projected OCS Activities

Prelease Considerations

This *Final Alaska Annual Studies Plan FY 2003* (prepared June 2002) reflects consideration of the proposed lease sales in the *Final Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* (July 2002). In a frontier region such as the Alaskan Arctic with large and remote planning areas, potential environmental hazards associated with offshore activities, and still-developing technology required for hydrocarbon extraction, maximum lead-time is necessary to conduct adequate environmental studies.

The *Final Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* proposes lease sales in the Beaufort Sea in 2003, 2005, and 2007; and Chukchi/Hope Basin in 2004 and 2007; and in Cook Inlet/Shelikof Strait in 2004 and 2006. Norton Basin Planning has a sale proposed for 2003. But before MMS proceeds in Norton Basin, it will issue a request for nominations and comments and will move forward only if environmentally acceptable blocks are nominated by industry. If this does not occur, the sale will be postponed and the process will be repeated the following year and so on through the 5-year schedule until a sale is held or the schedule expires (see Fig.1). Studies proposed for FY 2003 are for EISís and related documentation for these possible lease sales.

Preparation of the EIS is the most important part of the prelease process that requires environmental information. In particular, information is needed in time to prepare draft EISís for proposed lease sales. Although much information exists for certain Alaska OCS lease areas, changing conditions and environments often lead to the need to update past studies so that EIS information is current and accurate.

Postlease Considerations

Prior to FY 1982, most studies of the Alaskan offshore were planned, conducted, and concluded before a sale was held to provide decision information for EISís. However, not all information needs can be obtained prior to a sale. In accordance with mandates of Section 20(e) of the OCS Lands Act, as amended, postlease studies are needed to address environmental concerns and monitoring related to specific developments. The MMS acquires additional information for

environmental analyses related to development and production in the postlease phase environmental analyses. Thus, an increasing number of studies have become more closely related to development schedules and monitoring and evaluation in addition to those broader studies related to the prelease phase. As with the prelease phase, the wide range of environmental conditions from Cook Inlet to the Arctic and planning lead times are accounted for in the process of formulating new studies for the ASP.

Postlease activities that raise issues and require environmental data and assessment are:

- Geophysical surveys.
- Exploration drilling.
- Development, construction, and production activity.
- Oil transportation, including pipelines and tankers.
- Lease termination or expiration (platform abandonment).

As of October 2001, exploration, artificial-island construction and abandonment, and unitization agreements (including suspension of leases) have occurred.

In the Beaufort Planning Area, there have been 716 tracts leased in eight OCS Lease Sales. There are currently 54 active leases (see Fig. 2). Thirty exploratory wells have been drilled and 11 were determined to be producible.

Beaufort Sea Planning Area Lease Sales

Sale BF - December 1979	Sale 71 - October 1982
Sale 87 - August 1984	Sale 97 - March 1988
Sale 124 - June 1991	Sale 144 - September 1996
Sale 170 - August 1998	

The British Petroleum Exploration Alaska (BPXA) Northstar development project is located about 10 miles north of Prudhoe Bay (see Fig. 2 and Fig. 3). While the Northstar Island is in State waters, 6 to 7 wells will be on the OCS. The project was approved by the U.S. Army Corps of Engineers May 1999 and by MMS September 1999. Construction started in the winter of 2000. Production started the last day of October 2001. Recoverable reserves are estimated at 158 million barrels of oil, with peak daily production estimated at 65,000 barrels per day.

A second BPXA proposed project is the Liberty Unit in Foggy Island Bay (see Fig. 2). It is located about 6 miles east of the State Endicott Project. MMS released the *Draft Environmental Impact Statement for the Liberty Development and Production Plan* (January 2001). In January 2002 BPXA put the Liberty project on hold. MMS issued the Final EIS for the project in May 2002. Recoverable reserves are estimated at 120 million barrels of oil.

AEC Oil & Gas (USA) Inc. filed a plan for exploration on McCovey in the fall of 2002 (see Fig. 2). MMS approved the plan in February 2002.

The only other active leases are in the Cook Inlet Planning Area. Cook Inlet Lease Sale 149 was held in June 1997 and generated two leases (see Fig. 4).

There are no active leases from previous lease sales in the Chukchi Sea or Hope Basin portions of the Arctic Subregion, or in the Bering Sea or Gulf of Alaska Subregions (see Fig. 1).

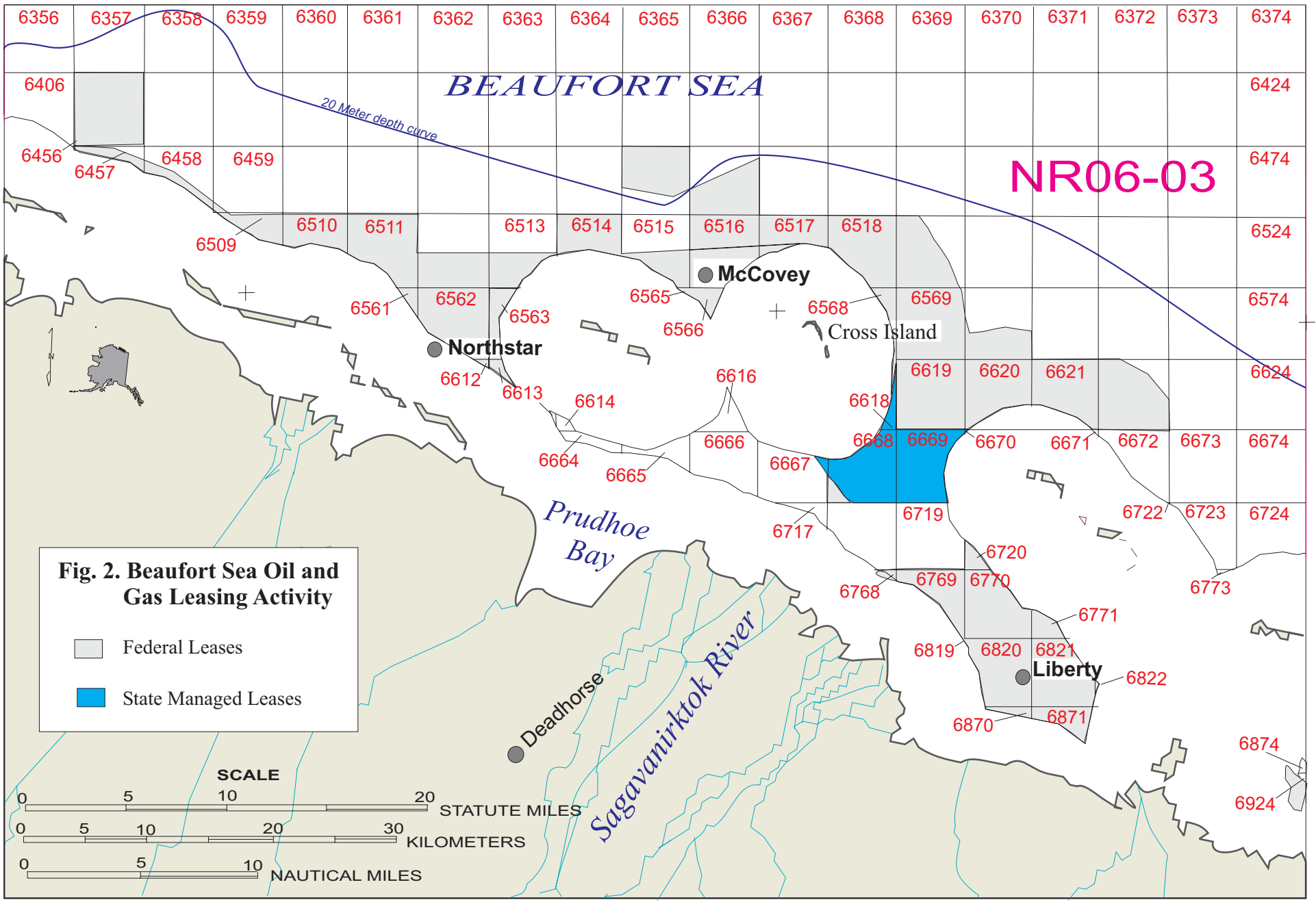
Section 1.3 Identification of Information Needs

We distributed the *Alaska Annual Studies Plan FY 2003* (prepared in October 2001) with a letter to approximately 200 Federal, State, local, environmental, Native, industry, international, and other requesting suggestions for new studies for the FY 2003. We considered comments in response to that request and previous program reviews. In addition, we requested suggestions for new studies from all components of the Alaska OCS Region staff and considered their comments in identifying needed studies.

The ESP also relies heavily on information needs identified through solicitation of public comment and suggestions on how to enhance our information base at information transfer meetings (ITM) and other meetings. For example an ITM was held in January 1999. Approximately 1,000 invitations for the ITM were sent to State and Federal Agencies; borough, city, and village leaders; oil and fishing industry personnel; environmental groups; scientists; contractors; and others. Approximately 200 people, including about 30 MMS personnel, attended various sessions. Also, in March 2000, the Beaufort Sea Information Update Meeting (IUM) was held in Barrow at the request of the North Slope Borough. Over 100 attendees heard 15 presentations. We held another ITM in April 2001 with mailing of a similar number of invitations to the same range of entities. Approximately 100 people attended various sessions. At each of these meetings session chairs encouraged attendees to comment on the information available, either through oral participation in the question-and-answer periods or afterward in writing. At the Beaufort Sea IUM, we participated in an auxiliary meeting and local residents expressed ideas for new study needs.

Several of the approved and proposed studies address recommendations from Cook Inlet communities and the Cook Inlet Regional Citizens Advisory Council (CIRCAC); and a few of the proposed studies also were highlighted in previous ESP plans.

Some of the studies address recommendations from the NRC in the Alaska ESP. The review is entitled ìEnvironmental Information for Outer Continental Shelf Oil and Gas Decisions in Alaskaî (NRC, 1994). The NRC report was prepared in response to a request from the U.S. House of Representatives that MMS seek NRC advice about the adequacy of environmental information for Beaufort Sea lease sales. The NRC committee concluded that the environmental information currently available for the Beaufort Sea OCS area is generally adequate for leasing and exploration decisions, except with regard to effects on the human environment (NRC, 1994: Executive Summary, p. 3). Since that time, the MMS has enhanced research components on the human environment.


BEAUFORT SEA
20 Meter depth curve
NR06-03
McCovey
Northstar
Cross Island
Prudhoe Bay
Deadhorse
Liberty
Sagavanirktok River
6356 6357 6358 6359 6360 6361 6362 6363 6364 6365 6366 6367 6368 6369 6370 6371 6372 6373 6374
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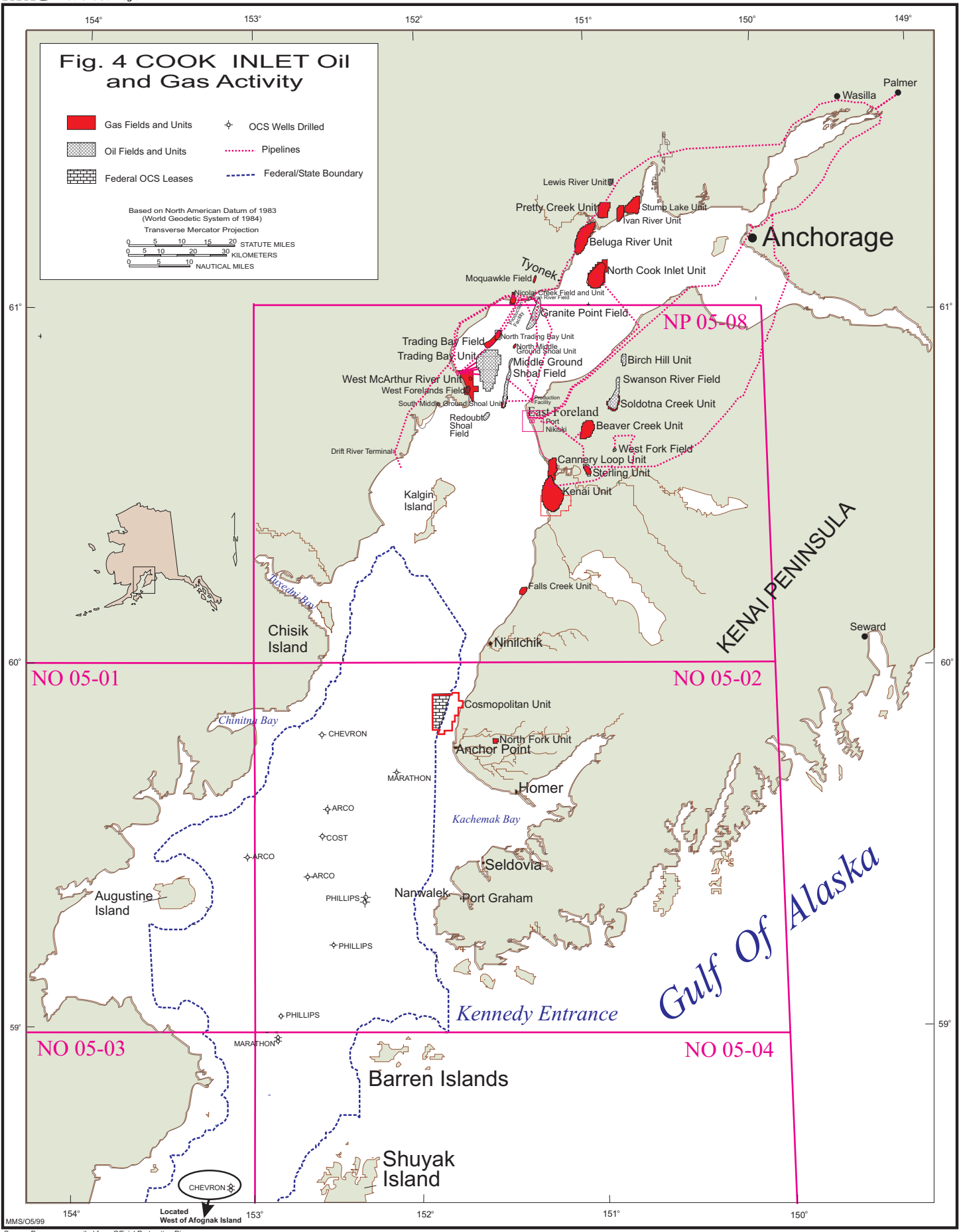
6720 6768 6769 6770 6773
6771 6819 6820 6821 6822
6870 6871 6874
6924
Fig. 2. Beaufort Sea Oil and Gas Leasing Activity
Federal Leases
State Managed Leases
SCALE
0 5 10 20 STATUTE MILES
0 5 10 20 30 KILOMETERS
0 5 10 NAUTICAL MILES

Fig. 3 Northstar Island looking north, September 2001. Production started in November 2001.



MMS/O5/99

Source: Base map compiled from Official Protraction Diagrams.

The Alaska ESP has also considered a series of reviews of the national ESP by the NRC. The reviews are entitled ìAssessment of the U.S. Outer Continental Shelf Environmental Studies Program.î Volume I focuses on Physical Oceanography (NRC, 1990), Volume II on Ecology (NRC, 1992*a*), and Volume III on Social and Economic Sciences (NRC, 1992*b*); Volume IV summarizes Lessons and Opportunities (NRC, 1993).

Although the NRC (1994) concluded that the ESP in Alaska is generally extensive, substantive, and of high quality, it recommended documenting more carefully the changes in the human environment that result from all phases of Federal actions on the OCS.

In addition, the NRC review mentioned the importance of documenting long-term, gradual sociocultural changes from all phases of OCS activities. The NRC also recommended careful quantification and analysis in social and cultural assessments. Proposed and ongoing social science studies would further meet this recommendation.

Beaufort Sea General Information Needs

Long-Range Monitoring of Interdependent Physical, Biological, and Social Processes:

Both offshore and onshore oil and gas development and production activities are increasing across Alaskaís North Slope. Residents of Nuiqsut, Kaktovik and Barrow are particularly concerned about long term effects of offshore developments at Northstar and other possible developments as well as long-term and cumulative effects of any exploration from OCS Beaufort Sea lease sales. Interagency reviews of related EISís and Development and Production Plans are expected to lead to additional recommendations for monitoring impacts of Northstar and other possible developments. Key constituents have identified the need to monitor under ice currents, sedimentation, and potential effects on social systems/subsistence in the vicinity of Northstar and Liberty developments. Related questions that need to be addressed are the characteristics of major oceanographic and meteorological processes and how they influence the human, marine and coastal environment.

Information on Bowhead Whales and Other Wildlife: Inupiat whale hunters rely heavily on bowhead whales for subsistence. The bowhead whale is central to village cultural and spiritual life. Whale hunters have observed that migrating bowhead whales deflect from their normal migratory route well upstream of active seismic vessels and divert their migration route far offshore. They contend that deflection around oil- and gas-industry activity (including drilling activity and associated icebreaker support) forces whales farther and farther offshore, making them harder and more dangerous to hunt. They also are concerned that whales may avoid traditional feeding grounds and are concerned as to the extent to which certain areas are important feeding grounds for migrating bowhead whales. Noise from industrial activity is the central concern.

These concerns are addressed in part by ongoing studies such as the MMS Bowhead Whale Aerial Survey Project (BWASP) and the study titled ìBowhead Whale Feeding in

the Eastern Alaskan Beaufort Sea: Update of Scientific and Traditional Informationî scheduled for completion in July 2002. Also, a study currently under contract titled ìReference Manual and GIS Geospatial Database of Oil Industry and other Human Activity (1979-1998)î is collecting information on past human activities in the Beaufort Sea and will provide this information to proposed future studies. Analysis of this information for covariance of human activities and sea ice in relation to fall migrations of bowhead whales will be needed. It is important to assess the factors that may be affecting the migration routes of bowhead whales.

The populations of bowhead whales, polar bears, beluga whales, spectacled eiders, and other endangered species are an ongoing concern of environmental groups, Federal agencies, and the International Whaling Commission. North Slope villages are particularly concerned about potential disturbance of ringed seals, waterfowl, and other subsistence-wildlife species by oil-industry activities such as helicopter overflights.

Native Culture: The Inupiat feel that their culture is vulnerable to short-term, long-term, and cumulative effects from OCS activities. They feel OCS activities might lead to:

- Social disruption and a change in cultural values through population shifts (immigration of large numbers of non-Inupiat to the North Slope).
- Employment changes (further displacement of the subsistence lifestyle by a cash economy).
- Cumulative effects of multiple industrial activities, alteration of subsistence-harvest patterns and displacement of hunters and subsistence resources.

The anticipated decline in oil revenues to the North Slope Borough is an issue of concern to the Natives also.

The Inupiat rely on a wide variety of marine resources as significant sources of food. In addition, the harvesting, sharing, and consuming of subsistence resources form an important part of the traditional Inupiaq culture and spiritual life. The Inupiat are concerned that a temporary or permanent elimination of primary subsistence foods would cause North Slope residents either to shift to less desired subsistence resources or to replace subsistence foods with expensive Western foods. The Inupiat are concerned about mitigation, including compensation, for potential losses. There is a need to monitor potential key indicators of socioeconomic and cultural changes of communications on the North Slope.

Another concern is the use of traditional Inupiaq knowledge in analysis of potential environmental effects; mitigation measures to protect environmental resources; and general offshore planning, leasing, and regulation of industry activity. We should continue to recognize and include firsthand knowledge of local subsistence hunters to augment the Western-science knowledge base.

Pollutants: North Slope villagers are concerned about any potential contamination of their food supply. In the Beaufort Sea, such foods include bowhead whales, seals,

waterfowl, and fish. Of particular concern is the fate, behavior, and cleanup of a major oil spill and the potential mortality to marine wildlife in open water or effects resulting from entrainment of oil in sea ice. Other oil- and gas-industry activities are perceived to pose a threat of contamination through drilling mud disposal. Related to these concerns, additional information is needed regarding currents carrying oil under ice. The most current information on climate and ice is important to addressing these concerns.

Small portions of the Beaufort sea floor near the Liberty development unit have a special benthic environment referred to as the ìkelp communityî or the ìBoulder Patch.î Sediments or pollutants associated with oil- and gas-industry activities could negatively affect this unique environment.

Chukchi/Hope Basin General Information Needs

The fundamental issues in the Chukchi/Hope Basin are very similar to the Beaufort Sea. The Native culture focused on subsistence, particularly on marine resources, predominates in these regions. These issues likewise interrelate with physical and biological processes and pollutants. The major difference is that the last OCS activity in the Chukchi Sea was in the early 1990's and no OCS activity has occurred in the Hope Basin. MMS has conducted studies in the Chukchi/Hope Basin but they are relatively fewer since the early 1990's compared to the Beaufort Sea. The *Final Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* proposes Chukchi/Hope Basin Lease sale in 2004 and 2007. We propose several studies that will provide environmental information to address information needs in the Chukchi/Hope Basin.

Cook Inlet/Shelikof Strait General Information Needs

Physical Oceanography: The MMS Oil Spill Risk Assessment (OSRA) Model needs additional validation in Alaskan waters. A way to verify the OSRA is to deploy satellite-tracked drifters to measure surface currents. A few modest studies have been performed on surface currents in Cook Inlet. But more extensive information is needed particularly in middle and upper Cook Inlet. Also investigation of sand waves is needed

Protected Species: Beluga whales are vulnerable to potential oil spills in Cook Inlet. Noise from vessel traffic associated with oil development activities may temporarily disturb and displace belugas from preferred habitat areas. Additional information is needed to determine areas of Cook Inlet important to beluga whales during winter months to supplement information collected in 1997. Harbor seals are also vulnerable to a potential oil spill in Cook Inlet and their distribution and abundance should be studied.

Social Science and Economics: Drift net fishermen have expressed a concern about their nets getting caught on oil rigs or the loss of harvest resulting in premature release when the drift is toward a permanent facility. A study is needed to identify methods to mitigate these possibilities.

Information Access: Most of the common problems facing the public, researchers, and managers in Cook inlet is the poor understanding of the research needs, and public understanding of what numerous agencies are doing. A multi-agency tracking system of ongoing research in Cook Inlet and its watershed will help MMS focus funding decisions.

Norton Basin General Information Needs

The last EIS MMS prepared for this area was for Lease Sale 100 in 1984. Sale 100 was cancelled. Information in all disciplines would need to be updated. However, the *Final Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* proposes a new approach to leasing. MMS proposes a sale for 2003. However, before MMS proceeds, it will issue a request for nominations and comments and will move forward only if industry nominates environmentally acceptable blocks. See Section 1.3 Projected OCS Activities for a description of the system for further explanation. Also Norton Basin is on the schedule as a potential source of natural gas for local residents and businesses. Natural gas involves a smaller set of issues compared to those for OCS oil. An EIS will not be prepared prior to the request for nominations. Therefore it is possible the information updates needs may be relatively limited.

General Information Needs

The Alaska OCS Region has a need to have internet capability for the Sub-sea Physical Environmental Database. It also has a need for data management support.

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Section 2: Study Profiles

Section 2.1: Study Profiles for

Ongoing Studies

The status of ongoing studies can be found at:

www.mms.gov/eppd/sciences/esp/profiles/alaska.htm.

This website is up dated three times each year and includes:

- An updated status of each study.
- Report due dates.
- Related publications.
- Affiliated websites.

For all completed ESP Studies go to:

mmspub.mms.gov/

This has the Environmental Studies Program Information System (ESPIS). ESPIS provides access to all completed study products. ESPIS is a searchable, web-based, full text retrieval system allowing users to view reports online or download their complete text.

Region: Alaska

Planning Area: Beaufort Sea

Type: Cooperative Agreement with CMI

Title: Circulation, Thermohaline Structure, and Cross-shelf Transport in the Alaskan Beaufort Sea

Actual Costs (in thousands):
FY1998 - $623
FY2000 - $20
Total Cost: $643

Period of Performance: FY 1998-2002

Conducting Organization: UAF CMI

Description:

Background Current, temperature, and salinity time series are largely unavailable for the Arctic Ocean, including in the Alaskan Beaufort Sea. Forcing and time and space scales are hypothesized rather than identified and confirmed. There are high inter-annual differences in flow and coastal salinity, but insufficient data to decipher whether these differences are due to long term trends or just inherent variability. Although there is salinity, temperature, and other data available for the Arctic Ocean, there is only one full year of cross-shelf mooring data along the Alaskan Beaufort coast. Data from elsewhere in the Arctic Ocean indicate that the oceanographic state of the Arctic Ocean may have changed since the earlier study. This study will provide a second year of data.

Objectives

1. Determine the mean transport over the outer continental shelf and slope and the cross-shelf and vertical scales of the mean flow field.

2. Determine the magnitudes of transport variability and the dominant temporal and spatial scales associated with this variability.

3. Determine the relation between variations in temperature and salinity and variations in the flow field at time scales between the synoptic to the seasonal. Determine if changes in the baroclinic flow are consistent with changes in the cross-shelf density structure.

4. Determine the cross-shelf fluxes of heat, salt, and momentum. Determine if these are related to instabilities (eddy generation mechanisms) of the littoral flow.

5. Determine the relationship between observed flow and density variations and the surface wind field.

6. Compare the results obtained from the proposed field program with those collected in 1987/88 in prior MMS research, to determine whether recent large changes in the Arctic Ocean are also reflected in the Beaufort Sea.

7. Combine this data set with other measurements recently acquired from around the Arctic Ocean to provide an updated synthesis that relates the Beaufort Sea to the large-scale circulation of the Arctic Ocean.

Methods Moored instruments were deployed along the outer shelf and slope of the Alaskan Beaufort Sea. Five of the moorings were recovered after one year, in 1999. The sixth mooring could not be recovered in 1999, and will be recovered in 2000. The mooring data will be supplemented by hydrographic profiles collected during the mooring deployment and recovery cruises on a cross-shelf transect along the 147° W meridian.

Importance to MMS Understanding the physical oceanography of the Beaufort Sea is a necessary precursor to establishing accurate and reliable oil spill trajectory models. Results from such models are an important part of EIS analysis of proposed lease sales and choosing among alternatives. Oil-spill issues involving or resolvable by the trajectory model constitute half the public comments submitted on NEPA documents for decision-making on proposed offshore oil- and gas-lease sales on the Alaska OCS.

Date Information Required: Study results will be used for NEPA documentation for the proposed Beaufort Sea Sales in 2003, 2005 and 2007. The data will also be useful in evaluating development plans being submitted for the Beaufort Sea.

Revised Date: June 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Contract Modification

Title: Synthesis and Collection of Meteorological Data in the Nearshore Beaufort Sea: Extension

Actual Cost (in thousands)**:**
FY 2000 - $210
FY 2003 - $99
FY 2004 - $116
FY 2005 - $39
Total Cost: $454

Period of Performance: FY 2000-2005

Description:
Background Future development in the Alaska OCS will be in the nearshore region of the Beaufort Sea. We are collecting a two-year wind time-series set of meteorological data for the North Slope oil fields at Northstar, Milne Point, Endicott and Badami. All stations have been collecting data since January 2001. The MMS web site has been operating very well, providing data and pertinent information on the data collection effort. The web site URL is www.resdat.com/mms. There have been some technical and logistical problems with two of the meteorological stations. The station at Endicott is a remote site without hard line power. Since the station does not have hard line power, there have been some recurring problems with maintaining power and keeping the instruments frost free and operational during the months of late November through February. This is due to the lack of solar radiation and calm winds which are supposed to be powering the station. In addition, the station on Northstar Island is currently in a poor location for the collection of wind speed and wind direction data since the new BP processing facility was put in place on August 10, 2001. The new BP processing facility is blocking the instruments from the north. Adding a new set of instruments to the top of the new BP processing facility will allow us to obtain more accurate wind speed and wind direction data. In addition, updating the power supply at Endicott will provide MMS with more accurate and continuous data through the months of November through February.

We know from Kozoís research in the 1970's and 1980's that the upper air pressure fields, on which modeled wind fields used in Arctic regional circulation models are based, give increasing inaccurate results for surface winds within 20-30 kilometers of the Beaufort Sea coast. In OCS areas off the contiguous 48 States and in the Bering Sea, MMS has established a network of meteorological buoys to monitor the lower atmosphere over long periods (10 years). Recent CMI studies comparing simulated winds from different Arctic and hemispheric wind models to Pt.

Barrow winds are not relevant to this study. This is because along the Beaufort Sea coast towards the east, orographic and sea breeze effects are too great.

Objectives The objectives of this study are to continue to collect meteorological data in Beaufort Sea locations subject to current and proposed development. This study will add an additional year of data. This study will develop a wind time series for oil weathering models and sensitivity testing of MMSís nearshore and general regional circulation and trajectory models for the Beaufort Sea.

Methods The methods of this study are to:

1. Continue to collect an additional 1-year wind time series from Northstar, Endicott and Milne Point, Badami
2. Provide replacement parts as necessary for existing stations from previous study.
3. Add an additional station site to an offshore island.
4. Maintain the original four stations and one additional station from January 2003-January 2004.
5. Provide additional historical meteorological data (pre 1985, wind speed/wind direction data) beyond what was originally requested in a standardized format.
6. Coordinate collection of time series data with Alaska Department of Environmental Conservation efforts in its Air Quality and Industry Preparedness and Pipeline Programs.
7. Conduct cross-correlation statistical analysis of wind time-series data from Barrow, Deadhorse, Northstar, Endicott, Milne, Badami, and other relevant data sets.
8. Synthesize all existing North Slope meteorological station data from 2003 forward into an MMS-compatible database.

Importance to MMS The MMS uses circulation models requiring meteorological information in EISís, other environmental assessments, and oil-spill contingency planning. This information would be used in the MMS oil weathering model, the proposed nearshore circulation model, COZOIL, and would provide meteorological data to concurrent field. The database will used in validating the 10 m windfields that the MMS uses in the Arctic Regional Circulation Model and Oil Spill Trajectory Analysis.

Date Information Required: This study will support enhancement of circulation models and review of future oil-spill contingency plans. The information will also be used for EISís for proposed Beaufort Lease Sales in 2003, 2005, and 2007, and EISís for development and production plans.

Revised date: June 2002

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas and Hope Basin

Type: Cooperative Agreement with CMI

Title: Beaufort Sea and Chukchi Sea Seasonal Variability for Two Arctic Climate States

Actual Costs (in thousands):
FY 1999 - $282
Total Cost: $282

Period of Performance: FY 1999-2002

Conducting Organization: UAF CMI

Description:

Background Proshutinsky and Johnson (1997) recently showed evidence for the existence of two regimes or climate states for arctic atmosphere-ice-ocean circulation. Wind-driven motion in the Arctic was found to alternate between anticyclonic and cyclonic circulation with each regime persisting for 5-7 years, based on analysis of modeled sea level and ice motion. Anticyclonic wind-driven motion in the Arctic and Beaufort Sea appeared during 1946-1952, 1958-1962, 1972-1979, and 1984-1988. Cyclonic motion appeared during 1953-1957, 1963-1971, 1980-1983, and 1989-1997. The two climate states should differ in ice cover, ice thickness and drift, circulation (including reversal of the Beaufort gyre), ocean temperature and salinity, heat fluxes, wind speed, atmospheric pressure, cloudiness, and precipitation and runoff. Confirmation of significant climate state differences has strong implications for both circulation and oil spill modeling in the Arctic. MMS would need to take climate state differences into account to avoid unintentional bias and error in stochastic modeling of water, ice, or oil movement.

Objectives

1. Compare temporal and spatial variability of environmental fields at seasonal and inter-annual time scales.

2. Compare circulation and ice drift data for the two climate states.

3. Compare differences between ice cover for the two climate states.

4. Compare differences in 3D temperature and salinity distributions for the two climate states.

Methods

1. Analyze temporal and spatial variability of environmental fields using standard oceanographic statistical analyses, time series analyses, and empirical orthogonal function analysis.

2. Use hierarchy of modeling studies using a 3D circulation model to compare ice drift and ocean circulation under the two regimes.

3. Assign historical SMMR and SSM/I data collected since the late 1970ís and the Walsh Johnson data set (digitized ice charts for the period 1905-1995) to the two climate states and compare to calculate the differences in ice concentration/cover for the two states.

4. Use the 3D model to compare temperature and salinity distributions for the two climate states on the basis of model results and observational data collected during the two climate states.

5. Provide analysis for each climate state of:
    a. Remotely sensed ice motion fields.
    b. Simulated surface circulation, wind forcing, ice motion, and ice cover fields.

Importance to MMS This study is a precursor to evaluating models of Arctic circulation and oil spill trajectories. If this study confirms the importance of variable climate states in the Arctic, then it will provide support to the hypothesis that using data averaged across climate states to drive circulation models may not be advisable.

Date Information Required: This would be used for the Oil and Gas Leasing Program 2003-2008 EIS, and probable lease sales in the 2002-2007 Leasing Program.

Revised Date: June 2002

Region: Alaska

Planning Area: Beaufort, Chukchi, Bering and Cook Inlet

Type: Cooperative Agreement with CMI

Title: Alaska Sea Ice Atlas

Actual Costs (in thousands):
FY 2000- $195
Total Cost: $195

Period of Performance: FY 2000-2002

Conducting Organization: UAA

Description:
Background The most recent compilation of ice data information for the U.S. Beaufort Sea included a Beaufort Sea Atlas (compiled by Sohio in 1984) and an Alaskan Ice Atlas covering 1970-1983. In 1995, the National Ice Center (NIC) digitized the 1972 ñ 1994 unclassified hardcopy sea ice chart archive using services provided by the National Climatic Data Center (NCDC) in Asheville, NC. The charts were digitized as vector data, and then converted to ASCII gridded fields in the World Meteorological Organizationís Sea Ice in Gridded Format. These data have 25 km resolution. Biweekly ice coverages are currently available from the National Ice Center in ARC/INFO for the years 1996-1999. Digital files of historical records may also exist with the Canadian Ice Center for the Beaufort Sea. . Historical records of summer ice severity in the Alaskan Beaufort now date back to 1952 (44 years). Evidence shows that the 1990's have produced mild summers in keeping with warmer record temperatures worldwide. These changes in temperature need to be factored into MMS Beaufort Sea activities, both for lease sales EISís and subsequent exploration or development and production activities. These conditions must be included in an updated modern summary of ice condition in the Beaufort Sea and along the Alaskan coast. Information has not been updated/consolidated since the mid-1980's. The budget for this study assumes 25 percent participation from other interested agencies.

Objectives The goal of the study is to provide accurate high resolution digital sea ice products for the Beaufort Sea. The data will be used to evaluate ice conditions for current and proposed oil and gas development plans, review exploration plans, and for EISís. The sea ice data will be incorporated into the MMS environmental database, accessible by ARC/INFO/ArcView.

Specific objectives include:

1. Compiling and quantifying sea ice data collected from the 1970ís through the 1990ís into digital and geospatial formats.

2. Providing up-to-date description of Beaufort Sea ice environment for ongoing and future activities.

Methods

1. Inventory existing reports, databases, and baseline studies.

2. Formulate a design plan for ice subjects of key interest, mapping requirements; tables; graphs, and other software enhancements which best portray information needs (i.e., ice growth, frequency of ice invasions, etc.) in user-friendly manner.

3. Prepare updated digital atlas which includes maps, tables, graphs to cover: fast ice stability and ice movements (late May to early July); summer nearshore ice invasions (July to September) and ice growth during winter (December to April).

4. Prepare a retrievable database of sea ice coverages, user interface and analysis tools in Arc/Info.

Importance to MMS MMS will be better able to review development and production plans with the most up-to-date ice data. The maximum and minimum dates for ice formation and earliest and latest dates for projected use of ice leads are important variables in these plans. The most recent data on ice through 1983 does not reflect the warming climatic trends since 1983. The study will enable MMS to provide improved NEPA analysis for activities permitted by MMS.

Date Information Required: This updated ice information will be used for EISís and EAís for potential development and production plans after FY 2004.

Revised Date: June 2002

Region: Alaska

Planning Area: Cook Inlet

Type: Joint Funding/Interagency

Title: Drifter Testing and Evaluation for Oil-Spill Trajectory Modeling in Cook Inlet and Shelikof Strait

Actual Costs (in thousands): **Period of Performance:** FY 2002-2003
FY 2002: In Procurement, TBD

Description:
Background Over the past eight years, MMS has deployed several hundreds of satellite-tracked drifters for the purpose of measuring the surface currents and simulating oil spills in the Gulf of Mexico. The purpose of these activities was the testing, evaluation, and improvement of MMSís Oil Spill Risk Analysis (OSRA) model applied to the Gulf. However, no such evaluation study has been performed yet in Alaskan waters. Given the considerable differences in the physical oceanographic setting of these two regions, it is necessary to perform the same kind of evaluation of the OSRA model applied to Alaskan waters.

A few modest Lagrangian surface current studies have been performed in the Cook Inlet/Shelikof Strait. Burbank (1977) released drifters in and near Kachemak Bay; Muench, Schumacher, and Pearson (1981) released drifters from lower Cook Inlet; and Reed and Stabeno (1989) released drifters in the lower Shelikof Strait. The latter study released a small number of oil-spill-simulating drifters for the purpose of testing how well these drifters would follow an actual oil spill, in this case the Exxon Valdez spill.

While useful, these past studies provide too little information for a comprehensive evaluation of MMSís oil-spill modeling in this area. Also, there have been no Lagrangian current measurements in the middle and upper Cook Inlet. The study outlined herein emulates the excellent drifter studies performed in the Gulf of Mexico and will help MMS improve its OSRA conducted in support of lease sales in the Alaska Region. The budget figures above represent 50 percent of the cost of the study and assume 50 percent cost participation by other interested agencies.

Objectives The objective is the acquisition of a one-year-long, synoptic, Lagrangian realization of the mesoscale and tidal currents in the Cook Inlet and Shelikof Strait and concurrent meteorological observations, and oil-spill simulations numerous enough for a statistical evaluation of MMSís OSRA model applied to Alaskan waters.

Methods The surface currents will be observed by aircraft-deployed drifters as done in the SCULP and NEGOM projects in the Gulf of Mexico. Drifters will be supplemented by surface circulation radar mapping if the proposed FY 2003 radar mapping field study is funded by MMS.

Ten water-following (SCULP-type) drifters will be deployed every two weeks along the inlet and strait from a chartered aircraft for a total of 260 drifters. In each deployment cycle, two drifters will be deployed in each of the upper and middle of Cook Inlet and Shelikof Strait, and four drifters will be deployed in a rectangular array in the lower Cook Inlet. This deployment scheme may be adjusted later in the project if the earlier deployed drifter tracks suggest a better sampling scheme.

The drifters will be tracked by the ARGOS system employing ìmulti-satelliteî service in order to resolve the strong tidal signal in the currents better. The drifters will transmit for 30 days and then automatically shut off. The choice of 30 days is based on summer salt balance and the potential persistence of emulsified oil.

At selected locations and/or locations of practicality, five oil-following ìARGOSPHERE-typeî drifters will be deployed in Cook Inlet and in the Shelikof Strait. They will also be tracked for 30 days using Service ARGOSí multi-satellite service. The shipboard drifter deployments will be made from chartered fishing boats or volunteer fishermen if any can be recruited. Deployments will be concurrent with SCULP drifter deployments.

Finally, NOMAD-type meteorological buoys will be deployed in the area for the one year of drifter observations. The National Data Buoy Center (NDBC) will install the buoys and provide MMS with the digital data. One mooring will be deployed in each of lower Cook Inlet and the Shelikof Strait. Middle Cook Inlet may use an oil-platform based meteorology station and upper Cook Inlet a land-based meteorology station to avoid the seasonal ice pack. Although the tides are the dominate currents most of the time, the locally forced, wind-generated currents will be important too, especially for the oil-spill simulating drifters.

Importance to MMS This project will enable MMS to improve its oil-spill risk modeling applied to Alaskan waters. This in turn will enhance the credibility of MMS Cook Inlet EISís and related NRPA documentation. Public acceptance of OSRA results and analyses will be enhanced if accompanied by supporting drifter data for Alaskan waters.

Date Information Required: Data collection will be ongoing and the information will be fed into our data processing and analysis procedures.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea, Cook Inlet

Type: Competitive or Joint Funding

Title: Surface Circulation Radar Mapping in Alaskan Coastal Waters: Planning/Feasibility Study

Actual Costs (in thousands): **Period of Performance:** FY 2003
FY 2002: In Procurement, TBD

Description:
Background Over the past 25 years, oceanographic radar techniques (Coastal Ocean Dynamics Application Radar [CODAR] and Ocean Surface Current Radar [OSCR]) have been developed and improved to where detailed, gridded, 2-dimensional maps of surface circulation can be provided and recorded in real time. CODAR was partially developed in work for MMS in Cook Inlet two decades ago, but that developmental system did not provide useable data. More modern radar systems have been successfully used since in MMS-funded studies in offshore North Carolina, Central Gulf of Mexico and offshore Southern California.

Currents play a critical role in the transport and fate of spilled oil, but there is paucity of direct circulation measurements in some areas of the Beaufort Sea and Cook Inlet. Current meters provide data only at specific sub-surface points and not at the water surface, where the oil would be. These radar techniques provide a measured equivalent of a gridded circulation model and can be used as input to or validation for oil spill trajectory models.

Several entities, including MMS, NOAA, the Prince William Sound Oil Spill Recovery Institute, the University of Alaska Fairbanks, and oil industry have expressed interest in using circulation mapping radar techniques in Alaskan coastal waters, but no user-group or specific program has been developed for radar use. The radar units are expensive and cost and use-sharing rental agreements among multiple users is a preferred approach.

Objectives The objectives of this co-funded feasibility and planning study are to develop an Alaska circulation-mapping-radar users group and develop cost-effective strategies for radar mapping in the vicinity of likely oil development in the Beaufort Sea (especially the Liberty Prospect) and for Cook Inlet OCS and adjoining waters. Sharing and multiple use is necessary to reduce rental cost of the radar system. Other members of the users group may have interests in other waters. A Phase II program, to display radar systems, could result from this study.

Methods

1. Establish who potential radar users are and develop communication links.

2. Hold workshop to form a broad agency/academic/industry users group. In addition to physical oceanography, potential biological and fate/effects uses should be considered and potential users invited.

3. Develop information on advantages and disadvantages of competing radar systems for Alaska use. Include:
   - Costs
   - Resolution (2-D and velocity),
   - Deployment issues (footprint, height, number of radar units needed, etc.)
   - Arctic and subarctic specific maintenance issues (e.g., temperature constraints, remote locations, power supply)
   - Effects of ice concentration on radar measurements

   Specifically look at limitations of use for near the Liberty prospect in the coastal Beaufort Sea and in Cook Inlet.

4. Develop strategies and priorities for radar mapping in the vicinity of likely oil development in the Beaufort Sea (especially the Liberty Prospect) and for Cook Inlet OCS and adjoining waters, taking into account cost-sharing possibilities among multiple users and coordination with other studies such as the MMS nearshore Beaufort Sea current meter moorings and proposed Cook Inlet drifter study.

Importance to MMS The Oil-Spill-Risk Analysis (OSRA) is a cornerstone to regional EISís environmental assessments, and oil-spill-contingency planning. MMS is being tasked with providing circulation and oil-spill-trajectory information at higher resolution than feasible or justifiable by state-of-the-art modeling or current-meter technology. Oil-spill issues constitute a significant portion of public comments submitted on sale or development EISís in the Alaska OCS Region.

Date Information Required: Information from this study will be used to prepare future development EISís, lease sale EISís, and in reviewing and improving oil-spill-contingency plans, including any for the Liberty Prospect.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin,

Type: Competitive or Joint Funding

Title: Workshop on Sea Ice Circulation/Interaction Modeling for Nearshore Beaufort and Chukchi Seas

Actual Costs (in thousands): **Period of Performance:** FY 2003
FY 2002: In Procurement, TBD

Description:
Background Most basin-scale dynamic-thermodynamic models in general use relatively simple thermodynamics and ice thickness distribution approximating the ice as slabs of a one to few meters' mean thickness plus open water. While sufficient as a first approximation of the arctic ice pack, this treatment lacks the ability to sufficiently resolve the spectrum of ice thickness from thin new ice to thick ridged ice to fast ice that have been observed. In addition, the ice models in current state-of-the-art coupled ice/ocean models, including those current Rutgers and CMI models contracted by MMS, are based on empirical ice physics valid at a 100-km scale and extrapolated to smaller grid dimensions. MMS contributed to recent general "ice" workshops in Alaska and Japan that have dealt with ice engineering and oil-spill response in ice rather than the in the specific problem of modeling fine scale ice/ocean and ice/ice interactions. Recent research efforts, outside of MMS, are addressing the inclusion of a more sophisticated thermodynamic and ice thickness coupled to a dynamic sea ice model and ice-ice interactions on a one-to-few kilometer scale. Other research efforts have focused on the kinematics approach using discrete element models, which address individual floes. The resolution of ice models and ice data needs to be increased to address fine scale interactions necessary to model oil spill trajectories in the nearshore Beaufort and Chukchi Seas, including within and among barrier islands.

Objectives The objective of this study is to develop a workshop on state of the art of ice or ocean-ice modeling. The workshop will address how existing, new, or a proposed model(s) could be applied to the nearshore Beaufort and Chukchi Seas to meet MMSís needs for oil spill trajectory modeling in ice, including in and among the barrier islands. The workshop may be limited to addressing a single proposed state-of-the-art model if MMS determines that model to provide cost-sharing and scientific advantages to MMS. The workshop participants would make recommendations on ìbest modeling approachesî based on the MMSís ice modeling needs.

Methods

1. Conduct a workshop of invited ice, ice/ocean modelers, and model users (including biologists and fate/effects specialists) to discuss state of the art in sea ice circulation and ice/ocean

models and their applicability to both the nearshore waters, including barrier island lagoons, and to the open Arctic ocean

2. Provide the MMSís ice modeling needs to the workshop.

3. Develop recommendations for coupling existing models, developing new models, or for interagency development of a new model to meet MMSís needs for oil spill trajectory modeling in ice.

Importance to MMS The importance to the MMS is to gain state of the art knowledge on the best direction to proceed on ice modeling prior to investing studies money. This information will allow the MMS modeling group and the Alaska OCS staff to make an informed and optimum decision whether, and if so how, to proceed for modeling the nearshore Beaufort and Chukchi Seas. The workshop may also allow for the development of collaborative efforts on ice modeling.

Date Information Required: This study will start in early FY 2002 to support enhancement of circulation models and review of future oil-spill contingency plans. The information will also be used for proposed Beaufort Lease Sales and development EISís.

Revised Date: June 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Revision of the OCS Oil-Weathering Model: Phases II and III

Actual Costs (in thousands): **Period of Performance:** FY 1999-2002
FY1999 - $399
Total Cost: $399

Conducting Organization: SINTEF Applied Chemistry

Description:
Background This study follows the recommendations made in the recently completed study ìRevision of the OCS Oil-Weathering Model: Evaluation.î The OCS Oil-Weathering Model (OWM) had been used as a major analytical tool in every Alaska OCS EIS since the model was developed in 1983. The algorithms used in the model date from the late 1970ís and early 1980ís. The primary findings from the SINTEF study were that the existing MMS model was difficult to use because of antiquated code, that it was likely to produce erroneous results for many types of crude oil, and that its algorithms needed to be updated or replaced with ones that incorporated the past two decade and a half of oil spill research. The primary recommendation was that rather than updating algorithms and code in the MMS model, MMS would find it more cost-effective for MMS to buy into an existing state-of-the-art OWM.

Objectives The objectives of this study are to obtain an existing state-of-the-art OWM for MMS use and to upgrade the model to meet MMS needs.

Methods

1. Obtain existing state-of-art OWM.

2. Train MMS users.

3. Modify/improve the new OWM to meet MMS needs in environmental assessment and contingency plan review.

4. Add oils of concern to MMS to the OWM oil library.

5. Promote development of an experimental oil spill database that allows validation of model algorithms in various models against real data.

6. Provide Windows 95/NT, PC-based OWM code, any necessary software to run the model, usersí manual, 1-day workshop to demonstrate model and user training.

Importance to MMS Oil-spill fate and behavior cannot be derived fully from the MMS OSRA and depend on use of the Oil-Spill Weathering Model. The model provides EIS analysts with a common, quantitative set of spill scenarios. The rate of oil dispersion into the water column calculated by the model is used to estimate whether State and Federal water-quality standards and criteria would be exceeded by a spill, over what area, and for how long. The weathering model calculates the area covered by a spill, an important parameter for estimating effects; but the OSRA does not. The model calculates the persistence of the lighter, but most toxic, components of the oil slick. This calculation allows analysts to directly estimate persistence of toxicity, rather than assume, as in the OSRA, that these toxic components persist over the first 3 days of a spill. Because the size of a spill affects its weathering, the model helps distinguish between effects of larger and smaller ì>1,000-bblî spills, e.g., between the effects of an average tanker spill versus an average pipeline spill. The in situ viscosity and degree of emulsification provided by the model are used in assessing the mitigation by and effectiveness of oil-spill countermeasures such as mechanical recovery, dispersant, and in situ burning. The model is similarly used by industry and MMS for oil-spill-contingency planning and has been run for the Regional Response Team in real-time response to spills such as the *Exxon Valdez* spill.

Date Information Required: Information from this study will be used by the MMS, Alaska OCS Region, staff in preparing all future EISís and in reviewing oil-spill-contingency plans for OCS and coastal facilities.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Cooperative Agreement with CMI

Title: A Nowcast/Forecast Model for the Beaufort Sea Ice-Ocean-Oil Spill System (NFM-BSIOS)

Actual Cost (in thousands):
FY 2000 - $407
Total Cost $407

Period of Performance: FY 2000-2003

Conducting Organization: UAF CMI

Description:
Background This study will build on the recommendations and results from multi year simulations of Arctic circulation in an FY 1996-2000 study, recently completed CMI Arctic 2-D and 1.5-D modeling experiments, and additional Chukchi and Beaufort Sea circulation data derived from ongoing CMI and international Arctic oceanographic studies. The current models do not resolve the coastal barrier islands in the Beaufort Sea, where oil development is occurring.

Objectives The objective of this study is to obtain a finer resolution model to simulate circulation in the nearshore Beaufort Sea, with emphasis on the coastal waters <40 m deep between Harrison Bay and Camden Bay. The model will be designed to provide the information needed to run the MMS oil spill trajectory model and will also provide surface circulation fields that can be used to drive the MMS COZOIL model.

Methods

1. Nest the Princeton Ocean Model coupled with a Hibler-based ice model in a larger circulation ice-ocean model (CIOM), a 3-dimensional (wind, ice, ocean) model.

2. Feed the information to this finer grid model.

3. Provide the option of blending observational data into the modelóparticularly recent circulation, winds, and finer-scale ice data.

4. Provide simulated wind, current, and ice velocity fields on tape.

Importance to MMS The Circulation and Oil-Spill-Trajectory Model is a cornerstone to regional EISís, environmental assessments, and oil-spill-contingency planning. Oil-spill issues involving

or resolvable by the trajectory model constitute half the public comments submitted on EISís on proposed offshore oil and gas sales in the Alaska OCS Region. The MMS is currently using an Arctic basin model with 20-km grid spacing to project oil spill trajectories within 10-km of land for ongoing developmental Environmental Impact Statements. The model does not include the barrier islands even though the developments lie within the barrier islands. Model results are used to evaluate the risks and advantages of specific alternatives, and they are used to fine-tune protective lease-sale stipulations. The oil industry and MMS use the model results in preparation and review of postlease oil-spill-contingency plans. The Department of State used the model results to evaluate foreign policy implications of OCS activities. The U.S. Coast Guard uses model results in analysis of local, national, and international oil-transportation and spill-response issues. The Canadian and Alaskan oil industry and spill cooperatives have adapted portions of MMS circulation and trajectory models for their own application, including the placement of spill-response equipment. From the viewpoint of public and other governmental perceptions, it is critical to continue efforts to improve the art and reliability of circulation and trajectory models used in nearshore portion of the central Beaufort Sea.

Date Information Required: Information from this study will be used in preparing Arctic exploration and development EISís and in reviewing oil-spill-contingency plans for OCS and coastal facilities.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Area: Beaufort Sea/Chukchi Sea

Type: Competitive (FY 2000)/Joint Funding (FY 2002)

Title: Environmental Sensitivity Index Shoreline Classification in the Arctic

Actual Costs (in thousands):
FY 2000 - $154
FY 2002 - $ 45
Total Costs: $199

Period of Performance: FY 2000-2003

Conducting Organization: Research Planning, Inc.

Description:
Background Industry and State and Federal Agencies including MMS form the Alaska North Slope Task Force. Of this group the National Oceanic and Atmospheric Administration (NOAA) and the U. S. Coast Guard (USCG) are funding the compilation of industryís Environmental Sensitivity Index (ESI) shoreline classification and biological data from the Colville to the Canning River. The majority of the Beaufort Sea coastline was classified for sensitivity to oil spills 20 years ago. These ESI shoreline data are out of date and need to be remapped for the data to be useable.

The ESI data classify habitats along the shoreline such as rocky, sandy, or muddy shore. These data are needed for use in the MMS Corporate Environmental Database and for computer analysis using ArcView. The Coastal and Offshore Resource Information System (CORIS) is designed to provide an authoritative database for environmental analysis in MMS. With the use of peripheral programs, analysts will be able to quickly identify resources at risk and run analytical routines to determine potential impacts. Currently the oil industry has mapped ESI type data from the Colville to the Canning River. NOAA has published maps which are partially based upon these data and show the mapping of ìSensitive Shoreline Habitatsî between the Colville and the Canning Rivers. The ESI shoreline classification data are not in the CORIS format. Data on ESI shoreline type for the Beaufort Sea from Barrow to the Colville River and from the Canning River to the Canadian Border are more than 20 years old and are very generalized. They are not compatible with the accuracy of the CORIS data structure and are not in a digital format.

Objectives The primary objective of this study is to obtain an updated ESI shoreline data set for use in ArcView/Arc Info. The ESI shoreline data set will also be used in analysis of oil spill prevention plans and to facilitate faster and more accurate environmental analysis in the Beaufort Sea environmental impact statements and environmental assessments.

Methods

1. Use existing industry ESI shoreline data from the Colville to Flaxman Island and convert them into a data structure that builds on the CORIS data structure.
2. Identify any additional data completed by Industry by the start of this study and convert them into a data structure that builds on the CORIS data structure model.
3. Map the Beaufort Sea coastline ESI shoreline type from Barrow to the Colville and the Canning to the Canadian Border using aerial overflights and videography.
4. Select the appropriate number of sites for ground-truthing remotely collected ESI shoreline type data.
5. Establish ESI shoreline type data set using video and ground truth data. This data set is for Beaufort Sea shoreline from Barrow to the Colville River and from the Canning River to the Canadian border consistent with CORIS data structure and the resolution of the ESI data from the Colville to the Canning Rivers.
6. Create a data set containing:
   a. Water and land polygons
   b. Type of linear feature
   c. Source Code
   d. ESI Classification
7. Participate in partnership with NOAA/Hazmat for possible extension of this study to cover portions of the Chukchi Sea coast in FY 2002-2003. Collect the videotapes for EIS shoreline classification of the Chukchi Sea coast from Barrow to Cape Seppings (68 degrees N) during 2001 to save on logistics and mobilization costs.

Importance to MMS The ESI shoreline classification is an important part of the MMS environmental assessment of potential impacts from spilled oil. This study will improve MMSís ability to assess potential shoreline effects by providing direct information to analysts, improving the selection of environmental resource areas for the oil spill risk analysis model and improving the information base in the COZOIL model. This study will update the existing classification of shoreline in the Beaufort Sea and make the data available in a digital format. This information will be available in Technical Information Management System (TIMS) mapping for MMS decision-makers, EIS analysts and others who need the information for regulatory function. Extension of this study into Chukchi Sea shorelines is applicable to future OCS information needs in the possible event of further industry interest in the Chukchi Sea.

Date Information Required: The initial Beaufort Sea part of this study should be done in FY 2001 for review of oil-spill contingency plans for developments in the Beaufort Sea and preparation of EISís for possible future Beaufort Sea Lease Sales. The Chukchi part should be done in FY 2002 or FY 2003 for EISís for possible future Chukchi Sea Lease Sales.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea, Cook Inlet

Type: Cooperative Agreement with CMI

Title: Kinetics and Mechanisms of Slow PAH Desorption from Lower Cook Inlet and Beaufort Sea Sediments

Actual Costs (in thousands):
FY 1999 - $59
Total Cost: $59

Period of Performance: FY 2000-2002

Conducting Organization: UAF CMI

Description:
Background Adsorption to sediment particles is a key process in determining the transport and fate of polycyclic aromatic hydrocarbons (PAH) in the marine environment. Previous CMI-funded studies of lower Cook Inlet sediments have shown that a substantial part of PAH adsorption is not rapidly reversible. Further study is needed to develop the ability to predict how adsorption and desorption would affect the longer term persistence (and toxicity) of PAH contamination in Alaska marine sediments. Recent *Exxon Valdez* studies have shown that the residual PAH concentrations in contaminated sediments are more toxic at much lower concentrations that previously estimated.

Objectives The objectives of this study are to test the hypotheses:

1. PAH adsorption found apparently irreversible in earlier CMI experiments is reversible with longer reaction times or greater water-to-particle ratios.

2. Interactions of PAH with sediment organic matter are responsible for adsorption that appears to be irreversible.

3. The properties of sediment organic matter govern adsorption and desorption of PAH by marine sediments.

Methods Phenanthrene will be used as a test PAH. Adsorption and desorption of phenanthrene will be measured using radio-labeled phenanthrene at multiple phenanthrene concentrations over adsorption times up to 60 days. Desorption experiments will be followed for up to 180 days or until desorption reaches steady state. Sediments used will include characterized subsamples from CMI studies in nearshore Beaufort Sea and lower Cook Inlet. Coal samples from Cook Inlet are also being used as a substrate.

Importance to MMS The study will lead to better predictive capability for the environmental fate of PAH, based on effects of sediment organic matter sources and composition on desorption. Understanding differences in sorption between Cook Inlet sediments and Beaufort Sea sediments will help MMS analysts make use of information from both planning areas in EISís and EAís.

Date Information Required: The information will be used in preparation of EISís and EAís for probable lease sales and possible DPPís the Beaufort Sea and Cook Inlet.

Revised Date: June 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Cooperative Agreement with CMI

Title: Petroleum Hydrocarbon Degrading Communities in Beaufort Sea Sediments

Actual Costs (in thousands):
FY 1999 - $50
FY 2000 - $31
FY 2001 - $67
Total Cost: $148

Period of Performance: FY 1999-2002

Conducting Organization: UAF CMI

Description:

Background High latitude marine oil spills have demonstrated that the composition of microbial communities affects rates of hydrocarbon degradation. Prior MMS research in the Beaufort Sea in the late 1970ís and early 1980ís indicated that indigenous microbes in this environment were poorly suited for rapid hydrocarbon destruction. Little research has been performed on Beaufort hydrocarbon degraders since then and little is known about whether sediment microbes have acclimated to hydrocarbon inputs in the last 20 years.

Objectives

1. Evaluate the current degree of microbial community acclimation to hydrocarbons from Barrow to the Prudhoe Bay/Northstar/Liberty area.

2. Evaluate the effects of fine-grained Beaufort Sea sediments on rates of community acclimation.

3. Evaluate how Beaufort Sea sediments might affect bioavailability of petroleum to communities of acclimated microbes.

Methods Surface sediments will be collected and the following measured:

1. Sediment microbial enumeration assays for populations of specific metabolic types.

2. Sediment macronutrient levels.

3. Most-probable number assays (MPNís) for crude oil emulsifiers and marine heterotrophs.

4. MPNís for specific substrates (e.g., PAH and alkane metabolizing populations).

5. Direct counts of sediment microbes.

6. Microbial activity will be determined from enumeration assays and radiocarbon-labeled hydrocarbon assays.

7. Gas chromatography analyses for petroleum hydrocarbon in samples with higher microbial numbers/activity.

Importance to MMS This study will be useful to MMS in possible cumulative effects monitoring of upcoming offshore development along the Beaufort Sea coast. The data from the study will be comparable to the earlier MMS pre-development studies.

Date Information Required: This information will be used for EISís and EAís for probable Beaufort Sea Lease Sales and DPPs.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin, Cook Inlet, and Gulf of Alaska

Type: Cooperative Agreement with CMI

Title: The Role of Zooplankton in the Distribution of Hydrocarbons

Actual Costs (in thousands):
FY1999 - $ 20
Total Cost: $ 20

Period of Performance: FY 1999-2002

Conducting Organization: UAF CMI; University of Alaska Juneau, Oil Spill Recovery Institute; and NOAA

Description:

Background Copepods play an important role in carbon flux in marine ecosystems. Vertical transport of carbon from the euphotic surface water to the benthos occurs when copepods feed on diatoms and incorporate them into larger, negatively buoyant fecal pellets. Therefore, analysis of hydrocarbon content of fecal pellets would provide insights in understanding the role of copepods in distribution and remediation of hydrocarbons. Data derived from analysis of copepod fecal pellets will provide baseline information for experimentation and modeling of ecosystem processes, which include accumulation of hydrocarbons in higher trophic levels such as commercial fish species.

Objectives The objectives of this study are to determine the role of copepods in the distribution and bioremediation of hydrocarbons in the environment. Specifically, this study will:

1. Determine the composition and seasonal variation of lipids in forage plankton in Prince William Sound.

2. Determine the relationships between lipid content and lipid composition in forage plankton and patterns of accumulation of hydrocarbons in copepod body tissue.

3. Determine the role of the copepods *Neocalanus* spp. and *Pseudocalanus* spp. in the distribution of mineral hydrocarbons in the environment.

Methods A series of experiments will be conducted at Auke Bay Lab (ABL), in Southeast Alaska:

1. Collect copepods from Prince William Sound and Lynn Canal, near Auke Bay.

2. Collect zooplankton weekly from Lynn Canal, during April ñ August 2000, using vertical tows of a bongo net.

3. Place the subject species in incubators and exposed to sublethal concentrations of hydrocarbons (~10 ppm) for 96 hrs. At the end of the experiment, collect copepods and their fecal pellets and take to ABL for analysis of lipids and hydrocarbons using standard operating procedures developed by the Lab.

4. To evaluate the influence of oil exposure on egg production, sort experimentally dosed female copepods alive into individual containers, and conduct egg production experiments every 2 weeks.

5. Concomitant with live sampling for experimental animals, collect a sample for lipid analysis and immediately freeze for later analysis at ABL. For evaluation of differences in hydrocarbon uptake due to amount of surface area, collect measurements of length, wet weight, and dry weight of zooplankton from a random sample as often as experiments are conducted.

Importance to MMS This experimental study provides valuable information at the level of primary consumers about processes that affect the transference of hydrocarbons through the food chain and water column. It specifically supports the environmental assessment process for potential lease sales in Cook Inlet and, in general, supports assessments for potential developments in northern latitudes.

Date Information Required: This information supports pre- and post-lease information needs for Cook Inlet lease sales.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea

Type: Cooperative Agreement with CMI

Title: Trace Metals and Hydrocarbons in Sediments of Elson Lagoon (Barrow, Northwest Arctic Alaska) as Related to Prudhoe Bay Industrial Region

Actual Costs (in thousands):
FY 2002 - $56
Total Cost: $56

Period of Performance: FY 2002-03

Description:

Background In the 1970ís, MMS funded the University of Alaska to conduct nearshore, inner shelf, contaminant studies in sediments of the Beaufort Sea, under the Outer Continental Shelf Environmental Assessment Program. MMS also initiated a regional monitoring program in the Beaufort Sea in 1984 designed to detect and quantify long-term changes in the concentrations of metals and hydrocarbons in sediments and animal tissues. A previous study analyzed historical nearshore changes in metals and hydrocarbons from the Colville River Delta east to Prudhoe Bay. This study would compare levels of contaminants derived from municipal-related activities to levels of contaminants derived from petroleum-related activities in the North Slope nearshore region.

Objectives

1. Establish whether large-scale urbanization of the Barrow region has resulted in significant changes in the sediment trace metal content in Elson Lagoon
2. Compare levels in Elson Lagoon to levels in oil development areas of the Beaufort Sea.

Methods

1. Establish present concentrations of trace metals Cu, Cr, V, Ni, Zn, Sn, As, Cd, Ba, and PB in clay and total and methyl Hg in five samples of surficial Elson Lagoon sediment samples.
2. Measure normal and isoprenoid alkanes, triterpenoids, steranes and poly-aromatic hydrocarbons in surficial sediments.
3. Investigate historical changes in the trace metal concentrations in cores dated by ^{21}PB and ^{137}Cs methods.
4. Compare trace metal data from Elson Lagoon to levels previously measured in Prudhoe Bay-Colville Delta region and to threshold metal levels known to cause adverse effects on benthic marine organisms.

Importance to MMS MMS is responsible for monitoring OCS development at Northstar under the OCS Lands Act. In addition, the AEPS prescribes that signatory Arctic nations monitor and

control six types of pollutants including oil, radioactivity, persistent organic contaminants such as PAH and metals.

Date Information Required: FY 2003 for monitoring.

Submitted by: Alaska OCS Region

Revised date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea, Cook Inlet

Type: Competitive

Title: Persistence of Crude Oil Spills on Open Water

Actual Costs (in thousands): **Period of Performance:** FY 2003
FY 2002: In Procurement, TBD

Description:
Background The MMS typically evaluates a range of time periods such as 1, 3, 10, and 30 days to analyze the effects of open water oil spills in EISís and EAís. The MMS uses these time periods for the oil spill trajectory analysis. State-of-the-art oil weathering models such as those currently used by MMS and NOAA only address initial weathering, the evaporation and vertical dispersion, and are not useful to determine the end point for trajectory modeling of oil spills on open water. Only for the lightest crude oils are evaporation and dispersion going to be useful for determining the persistence of crude oil on open water. For heavier oils, these models essentially project that even a one-cup spill would create a permanent slick (which may continue to expand). None of these models track slick integrity. Nor do databases for existing weathering models and other databases maintained by MMS and others compile the necessary spill information as to when slicks visibly dissipate as function of time or spill size.

Objectives The objective of this study is to collate and analyze historical data on the persistence of crude oil on open water primarily in relation to spill size. Additional factors that relate the persistence of crude oil on open water will be identified and analyzed. For example, the persistence of the *Exxon Valdez* crude in Prince William Sound after the first few weeks was due to re-oiling from oil stranded on surrounding shoreline rather than from the initial spillage. This study will provide historical validation for determining the persistence of crude oil spills *on open water* for setting end points for future trajectory modeling of various sizes of crude oil spills.

Methods
1. Identify the information about crude oil spills of at least 500 barrels necessary to collect to analyze the persistence of crude oil as an oil slick on the open ocean.
2. Conduct an extensive literature survey and or database survey from USDOI, MMS, USDOC, NOAA, and USCG reports, Marine Pollution Bulletin, Oil Spill Intelligence Report and other relevant sources to gather information identified in (1).
3. Synthesize collected data from (1) and (2) into a Technical Information Management System (TIMS) compatible format (Access or Excel).
4. Conduct predictive (statistical) analysis of persistence crude oil spills relative to size and other factors for setting generalized end points for trajectory modeling.

Importance to MMS This information will provide historical validation to determine the most appropriate time periods for oil spill trajectory modeling given an assumed spill size. This information is relevant to all Lease Sale and Development EISís and EAís.

Date Information Required: This study will start in FY 2002 to support future enhancement of circulation models and review of future oil-spill contingency plans. The information will also be used for Cook Inlet and Beaufort Sea Lease Sales and development EISís.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas and Cook Inlet and Gulf of Alaska

Type: Cooperative Agreement with CMI

Title: Seabird Samples as Resources for Marine Environmental Assessment

Actual Costs (in thousands): **Period of Performance:** FY 1999-2002
FY 1999 - $71
Total Cost: $71

Conducting Organization: UAF CMI

Description:
Background The birds of Alaska that are dependent upon marine environments are part of a complex array of more than 100 species occupying three trophic levels. These birds are a major component of Alaskaís marine ecosystems and may be vulnerable to both natural and anthropogenic changes, e.g., Outer Continental Shelf (OCS) activities. Many species provide an important source of food for humans, and more generally, are heavily used for a variety of subsistence purposes by Alaskan Natives. If analyses contrasting places or events are to be used to monitor the environment and biological systems, archival samples must be routinely preserved. Birds can be environmental indicators, and represent a useful model for such analyses.

Objective The objective of this study is to preserve high-quality samples from marine and coastal birds in Alaska for studies ranging from contaminants and stable isotopes to genetics and morphology.

Methods Samples from the Beaufort Sea and Cook Inlet will be given the highest priority. Collections will be made in connection with existing projects. Tissues and specimen data will be collected by a variety of participating scientists. Maximum use will be made of each individual bird, including when the quality of the specimen warrants it, the skin, skeleton, two tissue samples, and stomach contents. No chemical will be used in the preparation process, except when a specimen is particularly fatty. In such cases the fat remaining after fleshing the skin is often removed with a solvent (e.g., mineral spirits). Skin and skeleton preparations will be archival in quality, and are expected to last at least 300-400 years, given current information. Tissue samples will be archived in two, 2mL plastic cryovials and stored at ñ80 degrees C in the Alaska Frozen Tissue Collection (AFTC). Information on samples that are available to researchers for scientific study will be detailed in a web-site database.

Importance to MMS This study supports a source of bird tissues for use by scientists and other parties conducting studies of possible industrial pollutants. This will permit enhanced postlease monitoring in the Beaufort Sea and Cook Inlet. This project is needed to support monitoring for past, ongoing, and upcoming OCS activities on the Beaufort Sea and Chukchi Sea, Cook Inlet and Gulf of Alaska. Data products and annual reports will provide critical and timely inputs to the EISís and EAís. The study also will develop information useful to enhancement of outreach efforts with local constituencies.

Date Information Required: FY 2002

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea

Type: USGS Biological Resources Division

Title: Modeling Recovery Rates for Avian Populations

Estimated Costs (in thousands): **Period of Performance:** FY 2001-2002
FY 2001 - $125 (BRD)
FY 2002 - $125 (BRD)
Total Cost: $250 (BRD)

Conducting Organization: USGS Biological Resources Division

Description:
Background At least ten avian species, principally loons, waterfowl and shorebirds are found in the Beaufort Sea region and may be at potential risk of effects of oil and gas development on the Alaska OCS. Several species are listed under the Endangered Species Act (ESA) or have experienced unusual declines in recent decades. MMS documents have included estimates of the time needed for vulnerable avian populations to recover to their original level following an oil spill or other mortality event, but such estimates often are relatively subjective. It is important that MMS use statistically improved estimates of the potential for population recovery from possible mortality events. Species with highest priority for model development would be spectacled eider (model available), oldsquaw, common eider, king eider, yellow-billed loon, brant (model forthcoming), Stellerís eider, Pacific and red-throated loons, and red-necked phalarope. Lower priority species in areas where oil and gas development may occur in the future include common and thick-billed murres, black-legged kittiwake, marbled murrelet, and wintering Stellerís eiders. Data for various demographic parameters for some species currently need to be supplemented

Objectives The goal of this study is to hold a workshop in order to facilitate the development of a computer model, or models, that will estimate the time required for populations of avian species occupying the Alaska OCS to recover from certain levels of mortality caused by contact with an oil spill, or other perturbation. This effort would require accomplishing the following objectives:

1. Develop a model, or if necessary models, incorporating all variables and parameters required to yield realistic and accurate estimates of the time needed for each population experiencing various one-time mortality losses to recover to its initial level.

2. Develop the model(s) into a stand-alone interactive program with the capability to generate recovery rates associated with user-specified values for variables and parameters.

Methods A spectacled eider model of the type required by MMS has been developed recently; this can provide a basis for modeling other seaducks, and together with other existing models, it can be a starting point for modeling other species groups. Values necessary to model recovery rates for these species will require using appropriate values for such parameters taken from the literature. The Beaufort Sea Waterfowl monitoring study funded by MMS beginning in summer 1999 is expected to fill in some of the data gaps for oldsquaw and eiders. The recovery model, or models, will be produced during a workshop entitled: ìBeaufort Waterfowl Recovery Modeling Workshopî. Workshop participants will be of limited number, consisting mostly of experienced population modelers selected from all sectors, including governmental, academic and private. All available data for use in recovery modeling would be obtained, formatted and provided to participants well in advance of the workshop.

Importance to MMS The MMS analyses will benefit substantially from the addition of more accurate determinations of recovery rates following assumed losses from populations of species for which there is concern over the status and trend, or those listed under ESA. Information provided in this study would respond to concerns expressed by FWS and environmental organization reviews of Northstar and
NPR-A.

Date Information Required: Preliminary information is required early in FY 2002 for the probable Beaufort Sea Multi-Sale EIS.

Revised Date: June 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: USGS Biological Resources Division

Title: Alaskan Marine Mammal Tissues Archival Project

Actual Costs (in thousands):
FY1999 - $ 88 (BRD)
FY2000 - $ 88 (BRD)
FY2001 - $ 88 (BRD)
FY2002 - $ 88 (BRD)
FY2003 - $ 88 (BRD)
Total Cost: $444 (BRD)

Period of Performance: FY 1999-2003

Conducting Organization: USGS Biological Resources Division

Description:
Background Scientists, environmental groups and Alaska Natives are concerned about possible contamination of marine mammals from OCS-related discharges. Also, chemical pollution might adversely affect disease resistance in marine mammals. The collection of marine mammal tissues over a period of years allows for determination of contaminant load variation for comparisons with levels in specimens associated with oil spills or in the vicinity of drilling operations. Since adding a part-time USGS-BRD Biological Technician to the Project, the number of samples collected has increased. The project also has linkages with NOAA, a lead agency for Arctic Environmental Protection Strategy (AEPS) and Arctic Monitoring and Assessment Program. Tissues collected so far have come from Barrow, Point Lay, Point Hope, Nome, St. Paul Island, English Bay, Cook Inlet, Prince William Sound, the Aleutian Islands, St. Lawrence Island, and Round Island. Marine mammal species sampled so far include ringed seals, bearded seals, beluga whales, bowhead whales, spotted seals, harbor seals, northern sea-lions, northern fur seals, Pacific walrus, and polar bears. Aliquots have been analyzed from a representative number of these samples.

Objectives

1. Collect tissues from Alaskan marine mammals for long-term cryogenic archival.

2. Determine and monitor levels of heavy metals, polycyclic aromatic hydrocarbons (PAHís), and other potential contaminants associated with the oil and gas industry in marine mammals, with special emphasis on subsistence resources.

3. Monitor the condition of archived samples over time.

4. Develop new parameters and indices (e.g., biomarkers) to describe contaminant burdens.

5. Relate contaminant burdens to human-health-risk assessment.

Methods Tissues are collected under sterile conditions using titanium knife blades then stored at the temperature of liquid nitrogen. Because only fresh specimens are considered suitable for the rigorous analysis protocol, the collection of marine mammal tissues is fully coordinated with Alaskan village subsistence hunters, who participate directly in the project. Native villages provide various forms of assistance to the tissue archival program, including participation in the tissue-collection and cryogenic-storage process.

Upcoming analyses will focus on methods for detecting current or recent contact with petroleum through (1) improved PAH testing, (2) increased collection of metabolite biomarkers in liver bile, and (3) comparisons with potentially associated levels of vanadium. Specimen inventories will be provided for archiving.

Importance to MMS Information from periodic analyses of aliquots from this tissue bank are increasingly used to identify potential contaminants in subsistence foods. The study provides additional data in geographic areas of interest to the gas and oil industry. Tissues collected in the Beaufort Sea will continue to help monitor postlease activities pursuant to offshore drilling operations for Lease Sales 71, 124, 144, and 170. Continuity of funding for this study is considered important to maintain previously collected tissues in cryonic storage.

Date Information Required: This continuation study is needed to support monitoring for past, ongoing, and upcoming OCS activity in Alaska planning areas. Data products and annual reports will provide critical and timely inputs to EISís and EAís. The study will also develop information that addresses public concerns raised during outreach efforts.

Revised Date: June 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Cooperative Agreement with CMI

Title: The Alaskan Frozen-Tissue Collection and Associated Electronic Database: A Resource for Marine Biotechnology

Actual Costs (in thousands):
FY1998 - $75
Total Cost: $75

Period of Performance: FY 1999-2002

Conducting Organization: UAF CMI

Description:

Background The Alaska Frozen Tissue Collection (AFTC) collects animal tissues from a variety of species, thus addressing concerns of scientist, environmental groups and Alaskan Native subsistence hunters over possible contamination of marine mammals from various industrial sources. The AFTC has been collecting animal tissues for years, but it has been difficult to access the information on tissue analyses. The tissue inventory is fully computerized and, where available, shows latitudes and longitudes of collected specimens for potential GIS mapping.

Objectives

1. Increase the existing collection of tissues from marine mammals and other specimens of the Beaufort Sea, Cook Inlet, Shelikof Strait, and other planning areas.

2. Develop an electronic database that is accessible through the Internet, thus facilitating the transfer of information and sharing genetic resources among tissue investigators.

3. Ensure a long-term systematic record of frozen tissues from Alaskaís marine ecosystems.

Methods Tissues and specimen data are collected by participating scientists from marine mammals, birds, fishes, and invertebrates. The AFTC coordinates with the ongoing MMS/BRD Alaska Marine Mammal Tissue Archival Project (AMMTAP), to collect additional marine mammal tissues from fresh carcasses using AMMTAPís cryogenic tissue-collection protocols.

Importance to MMS Tissues are made available for contaminant and other types of analyses such as determination of the genetic status of harbor seals and other species. The study is developing an electronic database that is accessible through the Internet, thus facilitating the transfer of

information among interested investigators. The sample size of marine mammals sampled for AMMTAP will be enlarged and more tissues from marine mammals, birds, fishes, and invertebrates from the Beaufort Sea will be available for analyses of industrial contaminants of interest to oil and gas development. This will permit enhanced postlease monitoring and discrete stock identifications pursuant to Lease Sales 71, 87, 97, 124, 144 and 170 in the Beaufort Sea and Lease Sale 149 in Cook Inlet.

Date Information Required: This continuation study is needed to support monitoring for ongoing and upcoming offshore activities in all Alaska planning areas. Data products and annual reports will provide critical and timely inputs to EISís and EAís. The study also will develop information useful to enhancement of outreach efforts with local constituencies.

Revised Date: June 2002

Region: Alaska

Planning Area: Beaufort

Type: Joint Funding

Title: Use of the Beaufort Sea by King Eiders

Actual Costs (in thousands): **Period of Performance:** FY 2003-2006
FY 2002: In Procurement, TBD

Description:
Background The king eider population appeared to remain stable between 1953 and 1976. However a recent analysis of migration counts off Point Barrow, Alaska determined that king eiders have declined 56% (3.9% per year) from approximately 802,556 birds in 1976 to about 350,835 in 1996 (Suydam et al. 2000). King eiders migrate eastward along the Beaufort Sea during May-June to arctic nesting areas in Alaska and Canada. During molt-migrations in late summer and fall-migration (July-August), eiders move westward along the Beaufort Sea coast to overwintering areas in the Chukchi and Bering Seas. Although migration count data have been collected at Point Barrow intermittently since 1953, little information exists regarding the importance of the Beaufort Sea to king eiders in other locations. Petroleum related exploration and development has the potential to affect king eider populations. For example, the vulnerability of king eiders to an offshore oil spill was verified when at least 1,609 $\pm$ 70 king eider carcasses were found on St. Paul Island following an oil spill February 1996. Other effects could result from disturbance of resting or migrating flocks and death of individual birds due to strikes on offshore structures. The first oil development in the Beaufort Sea (BPXA Northstar) is scheduled to start production in November 2001 and other developments are likely. Additional information on patterns of migration and habitat use for king eiders in the Beaufort Sea would be useful for predicting the potential impact of petroleum related developments along the Beaufort Sea coastline.

Objectives
1. Document movements and locations of spring, summer and fall migrating adult female king eiders (successful and unsuccessful breeders) marked on breeding areas in Prudhoe Bay.
2. Describe potential staging areas used during spring and fall migration.
3. Determine if adult female king eiders (successful and unsuccessful breeders) molt in the Beaufort Sea prior to fall migration to overwintering areas.

Methods This study is envisioned as a jointly funded activity with key organizations potentially including: MMS, University of Alaska CMI, North Slope Borough, U.S. Fish and Wildlife Service, Canadian Wildlife Service, and U.S. Geological Survey- Biological Resources Division. The study will use implanted satellite transmitters (PTTís) to determine habitat use patterns and locate the migration corridor for king eiders. Female king eiders (60 successful breeders and 60

unsuccessful breeders) will be instrumented with implanted satellite transmitters (PTTís) on their breeding grounds and monitored during periods when they undertake spring and fall migrations. Satellite transmitters will also allow the opportunity to document the rates of migration across Beaufort Sea.

Importance to MMS Because basic biological parameters (i.e., population status, survival estimates, migration routes, and habitat requirements) for king eiders in the Beaufort Sea have been poorly described, assessment of potential impacts of offshore oil development are very limited in regard to protecting the species. Increased knowledge of this species could be incorporated with data being collected by the U.S. Fish and Wildlife Service and the Canadian Wildlife Service to better assess impacts.

Date Information Required: This study will provide information for proposed Beaufort Sea Lease Sale EISís and NEPA documentation for future DPPís.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN 2003

Region: Alaska

Planning Area: Beaufort Sea

Type: USGS, Biological Resources Division

Title: Monitoring Beaufort Sea Waterfowl and Marine Birds

Actual Cost (in thousands):

	MMS	BRD
FY1999 -	$164	$100
FY2000 -	-0-	$300
FY2001 -	-0-	$300
FY2002 -	-0-	$300
Total Cost:	$164	$1,000

Period of Performance: FY 1999-2003

Conducting Organization: USGS Biological Resources Division

Description:

Background Oldsquaw, eiders, and other waterbirds feed, molt, stage and/or migrate in various Beaufort Sea marine habitats. Recent data show that threatened spectacled eiders, as well as other species of concern, stage in nearshore and offshore Beaufort Sea waters. An existing protocol, entitled ìDesign and Testing of a Monitoring Program for Beaufort Sea Waterfowl and Marine Birdsî (OCS Study MMS 92-0060), was developed and tested in the Beaufort Sea area that includes the Northstar, Sandpiper, and Liberty Units. This study covers the areas and species most likely to be affected by activities associated with oil and gas development in these units.

Objectives The overall goal of this study is to monitor the effects of potentially disturbing activities associated with oil and gas development on the distribution and abundance of waterfowl and other waterbirds using marine habitats in the east-central Beaufort Sea. Specific objectives are to:

1. Develop a monitoring protocol to determine distribution and abundance of common eiders breeding on barrier islands.

2. Investigate potential effects of disturbance on oldsquaw and common eider annual cycle parameters that could cause changes in their distribution and abundance.

3. Compare the results with historical data to detect trends; coordinate with ongoing studies and incorporate pertinent interpretation of their findings into the final report.

4. Recommend cost-effective and feasible options for future monitoring.

Methods Waterfowl and marine bird populations will be monitored in the vicinity of ongoing and proposed oil industry activities in the east-central Beaufort Sea through three open-water seasons using an existing protocol that involves replicate aerial surveys of established transects and other areas indicated above. Specifically,

1. Use an existing protocol (Johnson and Gazey, 1992) to monitor numbers of oldsquaw and other species in *industrial* and *control* areas defined by these investigators, which is to:
   a. Perform replicate aerial surveys along previously established transects in a manner that will allow comparison with the earlier results.
   b. Expand the survey to include nearshore areas between the original *industrial* (Jones-Return Islands) and *control* (Stockton-Maguire-Flaxman Islands) areas.
   c. Define the range of variation for area waterfowl and marine bird populations, and correlate with environmental factors and oil and gas development activities.

2. Expand aerial monitoring about 50 km offshore to determine the extent of use of this habitat by eiders, in particular, where they would be vulnerable to oil spills originating in the Northstar and Liberty Units; determine if the use of specific areas is predictable.

Importance to MMS Data on waterfowl distribution and abundance from this study will be used to model the effect of various oil spill scenarios on Beaufort Sea waterfowl populations. A monitoring protocol will be developed that can be used to study the effects of offshore developments. Information from this study also will provide the basis for mitigation measures.

Date Information Required: Study information will be used for the probable Beaufort Sea Multi-Sale EIS and Northstar and Liberty monitoring.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea

Type: In-House Study/Interagency Agreement

Title: Monitoring the Distribution of Arctic Whales

Actual Costs (in thousands):
FY1999 - $ 325
FY2000 - $ 310
FY2001 - $ 350
FY2002 - $ 350
FY2003 - $ 350
Total Cost: $1,685

Period of Performance: FY 1999-2003

Conducting Organization: MMS

Description:
Background The MMS has conducted aerial surveys of the fall migration of bowhead whales each year since 1987. Methods are comparable from year to year, based on similar monitoring dating to 1979. Real-time data are used to implement overall seasonal restrictions and limitations on geological and geophysical exploration. The study provides the only long-term database for evaluating potential cumulative effects of oil- and gas-exploration activities on the entire bowhead-migration corridor across the Alaskan Beaufort Sea. Project reports compare distances from shore and the water depths used by migrating bowheads. Data are collected in a robust GIS-compatible data structure. The bowhead whale is protected under the Endangered Species Act and is of great importance to Alaskan Natives for cultural and subsistence purposes.

Objectives

1. Define the annual bowhead fall migration, significant inter-year differences, and long-term trends in distance from shore and water depth at which whales migrate.

2. Monitor temporal and spatial trends in the distribution, relative abundance, habitat, and behaviors (especially feeding) of endangered whales in arctic waters.

3. Provide real-time data to MMS and the National Marine Fisheries Service (NMFS) on the general progress of the fall migration of bowhead whales across the Alaskan Beaufort Sea for use in protection of this Endangered Species.

4. Provide an objective area-wide context for management interpretation of bowhead migrations and site-specific study results.

Methods Aerial surveys, based out of Deadhorse, Alaska, during September and October, monitor the fall bowhead migration between 140°W. and 157°W. longitudes, south of 72°N. latitude. Particular emphasis is placed on regional randomized transects, statistical tests, and power analyses to assess fine-scale shifts in the migration axis of bowhead whales across the Beaufort Sea, and on the coordination of effort and management of data necessary to support seasonal offshore-drilling regulations. The project analyzes migration timing, distribution, relative abundance, habitat associations, swim directions, water depths, and behaviors (especially potential feeding) of whales, as well as ice type and percentage at bowhead sightings. Belugas, gray whales, and polar bears are regularly recorded along with incidental sightings of other marine mammals. Data are also shared with site-specific studies to define bowhead responses to individual oil-industry activities. Incidental oceanographic observations are shared with the National Ice Center and National Weather Service to ground-truth satellite imagery.

Importance to MMS This continuing MMS study is needed for decisions on environmental assessment and exploration monitoring for past and upcoming OCS activity in the Beaufort Sea (from Lease Sales BF, 71, 87, 97, 124, 144, 170, 186, 195, and 202). It analyses behavioral information needed to identify areas of interest to feeding bowhead whales. In years with active offshore seismic-vessel or drilling operations, the BWASP provides real-time data to MMS and NMFS on each fall migration of bowhead whales across the Alaskan Beaufort Sea for implementing overall limitations on offshore drilling and geological and/or geophysical exploration. Project information is used to ensure that planned activities will not have an unmitigable adverse effect on the availability of the bowhead whale to meet subsistence needs by causing whales to abandon or avoid hunting areas.

Date Information Required: Information is needed each year to monitor the migration of bowhead whales past active seismic, drilling, construction, and production operations. Information from this study also will be needed in support of the proposed Beaufort Sea Multi-Sale EIS and monitoring of the Northstar and, if approved, Liberty developments.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea

Type: Cooperative Agreement with ADF&G

Title: Monitoring Key Marine Mammals: Arctic

Actual Costs (in thousands):
FY1996 - $368
FY1997 - $ 10
FY1998 - $165
Total Cost: $543

Period of Performance: FY 1996-2002

Conducting Organization: Alaska Department of Fish and Game (ADF&G)

Description:
Background Ringed seals have been identified as a ìkeystoneî species in the Arctic marine environment. They represent a top-level predator in the food chain and an abundant species that occurs on the OCS year-around. Their distribution is affected by operations, and their abundance probably could be affected by a substantial oil spill. During 1985-1987 ADF&G conducted a program with support from the MMS and developed a formal protocol for aerial surveys to monitor the distribution and abundance of ringed seals off the coast of northern Alaska. Using this protocol, ADF&G conducted ringed seal surveys during 1985, 1986, and 1987 along the Beaufort Sea coast. The 1989 monitoring report described their typical abundance and noted the range of natural variation. Since then, scientists collected site-specific data during industry exploratory operations. Scientists reviewed all of this information before they conducted additional monitoring surveys.

Objectives

1. Review and define the previously established protocol for monitoring ringed seals by aerial surveys.

2. Estimate relative abundance and density of molting ringed seals on fast ice in the Beaufort Sea during 1996-1998 and compare these estimates with data collected during 1985-1987.

3. Correlate ringed seal densities on fast ice with environmental parameters.

4. Determine abundance and density of molting ringed seals at and near industrial operations, and compare these with otherwise comparable nonindustrial areas.

5. Review adequacy of ringed seal data collected by past industry site-specific monitoring programs and make recommendations for protocols to be used in future industry studies.

6. Provide reports of findings that result from ringed seal monitoring to local residents and subsistence users.

7. Prepare manuscripts for publication including:
   a. The results of this study and a comparison of recent data with data from surveys in 1985-1987. b. The results of previous studies of the winter ecology of ringed seals.

Methods Significant improvements over the established protocols for ringed seals 1985-1987 surveys will include navigation by Global Positioning System and direct computer entry of all sightings and other data. In the first year, ADF&G re-analyzed data evaluated and monitoring protocols. Scientists flew limited aerial flights to test methods and to gather initial data on seal numbers in areas of industrial interest in the central Beaufort Sea. In subsequent years, scientists conducted extensive surveys throughout the U.S. Beaufort Sea, evaluated methods and began analysis of seal distribution and abundance. In the final year scientists will complete data analysis and reporting and prepare papers for publication. Scientists will compare data from this study with the baseline data of previous studies.

Importance to MMS This study will provide a sound, scientific protocol for aerial surveys to evaluate ringed seals in the Beaufort Sea area. Updated information on important biological populations in proposed oil- and gas-lease-sale areas will be used for EISís, postlease assessments and monitoring in the Beaufort Sea. Population estimates derived during this study facilitate postsale mitigation. The study will also provide information that addresses public concerns raised during outreach efforts.

Date Information Required: The products produced from this study could be used in the immediate future as they pertain to postlease Beaufort Sea Sale 144, for postlease permit approvals for Northstar and Liberty, and for the proposed Beaufort Multi-Sale EIS, scheduled for 2002.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Area: Beaufort Sea

Type: Contract

Title: Bowhead Whale Feeding in the Eastern Alaskan Beaufort Sea: Update of Scientific and Traditional Information

Actual Costs (in thousands):
FY1997 - $ 625
FY1998 - $ 376
FY1999 - $1,400
Total Cost: $2,401

Period of Performance: FY 1997-2002

Conducting Organization: LGL Limited Environmental Research Associates

Description:
Background The extent to which the bowhead whale population utilizes OCS areas in the eastern Alaskan Beaufort Sea for feeding, as well as this areaís importance to individual whales, is being studied to yield more definitive quantitative estimates. The study updates and improves on a major scientific report, which estimated that the eastern Alaskan Beaufort Sea is not an important feeding habitat for bowhead whales.

Objectives

1. Quantify the importance of the eastern Alaskan Beaufort Sea as a feeding area for bowhead whales.

2. Compare with appropriate literature and other available sources, including traditional-knowledge sources, for previous years.

3. Update available information on disturbance to feeding bowhead whales.

4. Characterize the ambient acoustic environment in the eastern Alaskan Beaufort Sea and predict sound levels of oil-and-gas-industry activity received by potentially feeding whales.

Methods

Phase 1/Year 1 - Planning: The study contractor/cooperators conducted a workshop and series of subsequent project meetings that designed, refined, and recommended hypotheses for evaluating/ estimating the importance of the eastern Alaskan Beaufort Sea as a feeding area for bowhead whales. Workshop and meeting attendees included representatives of the North Slope Borough

(NSB), Alaska Eskimo Whaling Commission (AEWC), Kaktovik Whaling Captains Association, MMS, National Marine Fisheries Service and an Inupiaq-language translator.

Technical activities considered by the group included, but were not limited to:

1. Analysis of the amount and condition of prey found in whale stomachs at Kaktovik and the stomach capacity of known-length whales.
2. Aircraft observation of area whale behaviors and any near-surface prey concentrations
3. Small-vessel plankton tows prior to and during the fall migration.
4. Satellite imagery of relative marine-nutrient and other oceanographic conditions.
5. Identification of bowhead feeding areas through analysis of radio-isotope ratios in the baleen.
6. Computer modeling of feeding information to determine the relative importance of the eastern Alaskan Beaufort Sea to the bowhead whales.
7. Acoustic characterization of potential feeding areas in the eastern Alaskan Beaufort Sea. Use of these data with existing noise-spreading models to predict sound levels received by feeding bowhead whales from hypothetical oil-industry noise sources at representative nearshore locations.

Scientist subsequently presented proposed out-year research to a Scientific Review Board (SRB) which included representatives from AEWC and NSB. The SRB concluded that a separate option for tracking bowhead whales using satellite tags, while not within the current budget, presented ìa significant potential to provide information relevant to many questions concerning bowhead behavior and utilization (*i.e.*, residence time) of the eastern Alaska Beaufort Sea.î

Phase 2 - Field Work, Data Analysis, and Knowledge Synthesis: Guided by the SRB, the research has focussed on analyses of stomach contents, behavioral observations by aircraft, plankton tows by small vessel, radio isotope ratios in baleen annuli, fatty acid comparisons, recording of traditional knowledge, and computer modeling of feeding information.

Importance to MMS The potential disturbance to bowhead whales by oil- and gas-industry activities and the importance of the eastern Alaskan Beaufort Sea to feeding bowhead whales were a partial basis for an MMS decision to adopt the Beaufort Sea Sale 144 Barter Island Deferral option. With additional information on the importance of the study area to feeding bowhead whales, alternative mitigation options for future Beaufort Sea lease sales may be feasible. The Arctic Region Biological Evaluation cited information that may help address potential critical habitat questions.

Date Information Required: The information is needed in time for incorporation in the Beaufort Sea Multi-Sale EIS.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Cooperative Agreement with CMI

Title: Correction Factor for Ringed Seal Surveys in Northern Alaska

Actual Costs (in thousands): **Period of Performance:** FY 1998-2002
FY1998 - $175
Total Cost: $175

Conducting Organization: UAF CMI

Description:
Background Scientists have already developed a protocol for monitoring ringed seal distribution and relative densities in Arctic waters for MMS. They also implemented over 6 field seasons during spring basking periods when the greatest number of seals are hauled out on the ice. This study will augment previous monitoring by permitting estimation of true ringed seal densities based on the number visible from an airplane. Useful information exists on ringed seal ecology and distribution in industrial versus control areas, but not enough to estimate true densities correctly. Scientists have found correction factors developed for harbor seals to be applicable to other years, as long as the correction factors and the survey estimates are in the same areas at similar times of the year. Most aerial surveys for ringed seals have attempted to standardize to late May to early June and to mid-day. The correction factors will facilitate re-analysis of historical data collected in GIS-compatible formats.

Objectives The goal of the study is to estimate a correction factor for the proportion of ringed seals not visible during aerial surveys and thereby, enhance the protocol for estimating Arctic ringed seal densities from aerial monitoring results. The study will also obtain useful quantitative information on ringed seal behavior obtained, as identified in the methods section.

Methods

1. Locate subnivean lairs using dogs trained to alert handlers to ringed seal scents on command.

2. Monitor the use of 20 subnivean lairs by seals using air temperature recorded in lairs by thermistor sensors connected to data loggers.

3. Compare the cumulative frequency of lair use by date among years.

4. During each aerial survey, calculate the proportion of lairs still active based on the

temperature records.

5. Instrument a sample of seals with radio- and ultrasonic-transmitters and their behaviors recorded by observers stationed on the ice surface.

6. Partition ringed seals not visible during aerial surveys into those under the ice and those in subnivean lairs.

7. Obtain quantitative information including:
   a. The temporal pattern in which ringed seals abandon lairs and begin to bask.
   b. The proportion and variance of the out-of-water population of ringed seals concealed within subnivean lairs during aerial surveys.
   c. The proportion and coefficient of variation of the population visible during aerial surveys.
   d. The frequency distribution of distances traveled between winter home ranges and sites occupied during the spring basking period.
   e. The relationships between date, distance to ambush cover, and group size for seals visible next to basking holes and cracks.

Importance to MMS Industry is planning offshore production of oil in the Beaufort Sea for the Northstar and, if approved, Liberty developments. Undersea-pipeline construction and increased vessel and helicopter traffic probably will generate additional acoustic and visual disturbance of ringed seals in marine areas. Such disturbance has the potential for causing some long-term abandonment of industrial areas. Providing a means to determine the true densities of seals observed in aerial monitoring will help us estimate the number of seals affected by such industrial activity. Also, estimates of absolute population size require a correction factor for the proportion of seals not visible during surveys.

Date Information Required: Study information will be used for the proposed Beaufort Sea Multi-Sale in 2002.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Cooperative Agreement with CMI

Title: Timing and Re-interpretation of Ringed Seal Surveys

Actual Costs (in thousands):
FY 2001 - $412
Total Cost: $412

Period of Performance: FY 2001-2004

Conducting Organization: UAF CMI, University of Alaska Southeast

Description:
Background Ringed seals are an important resource for Native people of northern and western Alaska and an important component of the ecology of the northern marine ecosystem. Aerial surveys have been used to monitor trends in the distribution and density of ringed seals in the Alaskan Beaufort Sea without correction for variation in the proportion of seals visible to aerial observers. With CMI support, the investigators used observations on radio-instrumented seals to show that the proportion of seals visible changed rapidly during a typical survey period as seals shifted from resting in lairs to resting in the open. Furthermore, the end of that transition was shown to be associated with measurable changes in snow conditions. In this study, the investigators will develop statistical models of the proportion of seals visible as a function of snow conditions and will use those models to reanalyze data from previous aerial surveys of ringed seals.

Objectives
1. Determine the relationship between snow conditions and the number of seals visible during spring surveys.
2. Determine the best methods for monitoring snow conditions and determining optimal survey times.
3. Reanalyze previous ringed seal surveys from the Beaufort Sea of Alaska.

Methods The study will be conducted at three sites in the vicinity of Point Barrow, Prudhoe Bay and Barter Island. At Prudhoe Bay, seal breathing holes and lairs will be located by trained dogs starting in December or January. Air temperatures inside and outside the lairs will be measured using thermistors with data loggers. Those records will be used to determine dates and durations of lair use by seals in relation to snow thickness and quality. The proportion of seals in and out of lairs and under the ice will be determined by radio tracking seals in April ñ early June. Aircraft will be used to monitor seals when snow gets too soft for surface travel, usually in early June. Automated meteorological stations will be used to continuously record air temperature, wind

speed and direction, and snow temperature in the sealís environment during April ñ early June at all 3 of the study sites. Historical data on snow and ice conditions will be used to determine whether past surveys were conducted before, during, or after the sealís transitions from lairs to resting in the open. If data on snow temperatures over the tundra are strongly correlated with those on the ice, historical data on snow temperatures over tundra will be used to retrospectively apply correction factors to previous surveys. The reliability of Ku-band backscatter radar data for determining changes in snow structure will be tested. To this end, the Jet Propulsion Laboratory will use radar to make a ìblindî determination of snow conditions at the three study sites. This result will be compared with data from each of the study sites.

Importance to MMS Industry may submit development and production plans for offshore production of oil in the Beaufort Sea. Post-lease undersea-pipeline construction is expected to result in additional acoustic and visual disturbance of ringed seals in marine areas due to increased vessel and helicopter traffic. Such disturbance has the potential for causing some long-term abandonment of industrial areas. Providing a means to determine the true densities of seals observed in aerial monitoring will help us estimate the number of seals affected by such industrial activity. Also, estimates of absolute population size require a correction factor for the proportion of seals not visible during surveys.

Date Information Required: FY 2004

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea

Type: Interagency Agreements with USGS Biological Resources Division

Title: Polar Bear Den Surveys

Actual/Estimated Costs (in thousands): **Period of Performance:** FY 1999-2002

FY1999 - $ 40
FY2000 - $ 17
FY2001 - $150
FY2002 - $150
Total Cost: $357

Conducting Organization: USGS Biological Resources Division

Description:

Background Two stocks of polar bear inhabit the Arctic OCS region. The Beaufort stock is shared with Canada and dens partly in the eastern Alaskan Beaufort Sea. Remote sensing of polar bear dens might be more reliable and safer than ground surveys. Aerial denning surveys would provide a measure of reproductive effort and success, and an index to population trends. Such surveys in prospective exploration areas could provide information for avoiding site-specific effects. A scientifically valid estimate of the Chukchi/Bering Sea population size is not currently available and current information on the population dynamics of the polar bear population is incomplete. The USGS-BRD, USFWS, and Russian scientists have conducted previous surveys of polar bear dens. Past survey efforts have been complicated by inconsistencies in survey methodologies, timing, and location and by the large variation in den estimates.

Objectives The goal is to reliably identify subnivean polar bear dens along the North Slope of Alaska.

Methods Phase I of a study will test and evaluate FLIR technology for conducting effective polar bear den surveys. The evaluation will take place at a workshop in Anchorage where participants would score FLIR aerial videography (recorded during January denning) and discuss the applicability of remote sensing methods and equipment for identifying polar bear dens. The workshop would also summarize existing information on polar bear den distribution and habitat features. The proceedings of this workshop and an evaluation of the success of the FLIR technology for detecting polar bear dens will be published as an interim report. Depending on the success of Phase 1, Phase II would further develop (and possibly purchase) appropriate remote sensing technology and design a repeatable survey protocol for surveying polar bear dens. Working cooperatively with the Fish and Wildlife Service, the protocol will then be used the

following winter to catalog polar bear denning sites, correlating them with denning habitat features and ambient observational conditions in the eastern Alaskan Beaufort Sea. The final report will include the revised final protocol and appropriate analyses of survey results.

Importance to MMS During the environmental review for Lease Sale 170 and the Warthog exploration plan, public concern was expressed regarding the environmental sensitivity of the eastern Alaskan Beaufort Sea and the lack of comprehensive biological baseline information. Information from the den surveys will be useful in decisions regarding mitigation measures. Population-dynamics information will be useful in assessing the effects of development, including habitat alteration, modification, and potential spills on the polar bears of this region. The Chukchi/Bering stock of polar bears is a shared population between the U.S. and Russia. In Russia most denning occurs on Wrangel Island, Herald Island, and the Chukotka Peninsula. Technology developed in this study would permit future joint U.S.-Russia den surveys of the Chukchi/Bering Sea population, developing valid statistical estimates of population status and trends.

Date Information Required: There is an ongoing need for information to monitor polar bear population trends and reproductive effort/success, and to assess potential impacts associated with potential offshore operations. If Phase II is implemented, study information will be used for the proposed Beaufort Sea Multi-Sale EIS and related baseline monitoring.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: USGS Biological Resources Division

Title: Simulation Modeling of the Effects of Arctic Oil Spills on the Population Dynamics of Polar Bears

Actual Costs (in thousands):
FY1999 - $150 (BRD)
Total Cost: $150 (BRD)

Period of Performance: FY 1999-2002

Conduction Organization: USGS Biological Resources Division

Description:

Background In order to predict the effects of oil spills on polar bears, data on oil spill trajectories must be married with data on polar bear distributions and abundance to yield hypothetical patterns of mortality. The long-term effect of the spill on the stability of bear populations can be predicted by applying a population recovery model to mortality data as derived above. A great deal is already known about the distribution and movements of mature female polar bears in Alaska OCS Beaufort Sea planning areas through an ongoing program of satellite tagging and tracking conducted by USGS-BRD. The USGS-BRD maintains a data set on polar bear distribution in Arctic waters. Information is also available on the potential effects of oil on individual polar bears. The MMS has an updateable arctic oil-spill trajectory model that is used each time there is a Beaufort Sea Environmental Impact Statement. The study is coordinated as appropriate with MMS oil-spill modelers.

Objectives The study design will link the efforts of BRD polar bear researchers and MMS oil spill modelers to predict the effects of hypothetical Beaufort Sea oil spills and other postulated mortality on the population recovery of polar bears. The study will develop computer program modules to this end. Specifically BRD researchers will:

1. Develop/refine an independent, conceptual, polar bear population-dynamics model for Alaskan waters, with assumptions and initial conditions that can respond to hypothetical removals. Conduct a sensitivity analysis of this model.

2. Create a database on expected mortality of polar bears under various oil spill scenarios that can be interfaced with oil spill trajectory models.

Methods The study will develop a model of polar bear population dynamics and use it to simulate population-level recovery from hypothesized removals due to potential oil spills. The model will have mechanisms for linking it with the MMS Oil Spill Risk Analysis (OSRA) model trajectories for the Beaufort Sea. The final work product will include appropriate data bases, computer programs and existing algorithms on polar bear life history, population dynamics, and known seasonal distribution in Arctic waters, based primarily on existing satellite-tracking data on adult female polar bears collected by USGS-BRD. The study will model hypothesized mortality and population recovery of both Beaufort and Bering/Chukchi Sea populations of polar bears in response to Beaufort Sea oil spills and other postulated mortality. BRD scientists will prepare the interactive model, compatible with MMS hardware and software standards at the time of completion, and a user-friendly manual. They will manual demonstrate the model and manual to MMS biologists, varying data input and model assumptions as appropriate for future lease sales.

Importance to MMS Polar bears are known to be highly sensitive to direct oiling. Some subsistence hunters and environmental groups previously expressed opposition to lease sales that might adversely affect polar bears. The study will enhance MMSís ability to predict the effects of a potential oil spill in the Beaufort Sea on large concentrations of polar bears such as those that den on Wrangel Island or that congregate near bowhead whale carcasses. The study will be beneficial in implementing the existing stipulation on protection of biological resources. The study will develop information that addresses public concerns raised during previous outreach efforts.

Date Information Needed: Study information will be used for the proposed Beaufort Sea Multi-Sale EIS.

Revised Date: June 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: USGS Biological Resources Division

Title: Use of Sea Ice Habitat by Polar Bears in the Southern Beaufort Sea

Estimated Costs (in thousands): **Period of Performance:** FY 2001-2002
FY 2001 - $60 (BRD)
Total Cost: $60 (BRD)

Conducting Organization: USGS Biological Resources Division

Description
<u>*Background*</u> Polar bears (*Ursus maritimus*) occupy ice-covered seas in northern and western Alaska. Polar bears remain with the sea ice throughout the year, and their range generally reflects the seasonal extent of sea ice. Availability of their principle prey, ringed seals (*Phoca hispida*), is dependent on the form and stage of sea ice. In particular, the near-shore region of the Beaufort Sea is an important hunting area for polar bears soon after the autumn ice has formed. Near-shore ice also serves as a stable substrate for maternal dens during the winter, and as an area in which seals are hunted by adult female bears with their new young during the spring.

Petroleum companies have extended their activities to include these nearshore areas as potential locations for exploration, construction of facilities, and extraction of oil. In addition to existing development, the petroleum industry will likely become increasingly interested in developing nearshore polar bear habitat as new recoverable hydrocarbon deposits are identified. Industrial development in polar bear habitat may result in displacement of bears from foraging and denning habitat because of activities associated with exploration and construction. Bears may die or experience chronic negative health effects as a result of spills of crude oil or other chemicals. In general, polar bears may be exposed to toxic substances and have an increased likelihood of direct interactions with humans.

Polar bears inhabit an environment that constrains direct observation of their behavior. Additional information about habitat use by bears would help managers make decisions regarding how to conduct human activities relative to sea ice conditions in polar bear habitat in the southern Beaufort Sea. With better data on polar bear behavior, the effect of human perturbations could possibly be reduced if human activities were managed to take into account polar bear ice-habitat relationships. Data on polar bear movements and sea ice conditions exist but have not been merged to permit analysis of polar bear habitat preferences relative to ice conditions.

Objective The objective of this study is to quantitatively describe the ice habitat types preferred by polar bears in the southern Beaufort Sea.

Methods Scientist will associate polar bear locations obtained by satellite radio-telemetry with NOAA weekly ice charts. Ice charts that include the coast of the Beaufort and Chukchi Seas are available and updated on a weekly basis from the National Ice Center (Washington, D.C.). Researchers will obtain this information from the National Ice Center through the Internet. Charts are geo-referenced and ice is identified by form, stage, and the percent of open water. Data are available either as GIF files for producing hard copies or as geographic information system (GIS) software ARC/INFO export files for spatial analysis. Locations have been recorded for instrumented adult female polar bears in Alaska since 1985. Scientists will use ARC/INFO to:

1. Extract ice habitat attributes and attach those attributes to polar bear locations.
2. Analyze habitat preferences and avoidance using log-linear statistical models.
3. Compare habitat use by season and reproductive status of bears.

Importance to MMS Polar bears are highly susceptible to spilled oil. The species is protected under the Marine Mammal Protection Act and any ìtakeî by disturbance, mortality, or otherwise requires a Federal Permit. MMS analysts can address concerns of polar bear welfare raised in EISís with the information gained through this study. Industrial activity in the southern Beaufort Sea is ongoing and will continue into the future, necessitating baseline data of polar bear habitat use.

Date Information Required: This study supports the proposed Beaufort Sea Multi-Sale EIS and future exploration and development activity.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas

Type: Cooperative Agreement with CMI

Title: Satellite Tracking of Eastern Chukchi Sea Beluga Whales in the Beaufort Sea and Arctic Ocean

Actual Costs (in thousands)
FY2000 - $75
Total Cost: $75

Period of Performance: FY 2000-2002

Organization Conducting: UAF CMI

Description:
Background Beluga whales are important subsistence species for indigenous people of the Alaskan Arctic and sub-Arctic coasts; more than 300 belugas are harvested annually by Alaska Native subsistence hunters. Studies funded by OCSEAP/MMS in the early 1980ís provide information about reproduction, food habits, and distribution and abundance in summer. More recent studies conducted by the Alaska Department of Fish and Game (ADF&G), National Marine Fisheries Service (NMFS), and the Alaska Beluga Whale Committee (ABWC) provide information about harvest levels, genetic stock identity, and abundance in summering areas. A 1994 NRC report recommends satellite tagging, stock identification, and monitoring studies for belugas. Satellite tagging offers a proven cost-effective and technologically sound approach to obtaining information needed on migration patterns and feeding areas. Scientists have captured belugas and instrumented them with satellite-linked tags at a variety of locations across the Canadian Arctic. However, belugas tagged in Canada are only one of several beluga stocks that are important to Alaska subsistence hunters and that are presumed to winter in the Bering Sea. Data are needed on the other stocks, particularly the Chukchi Sea stock. The study will emphasize cooperation between the MMS, local government, subsistence hunters, and scientists in its planning and execution.

The Alaska Beluga Whale Committee has worked cooperatively with ADF&G, the NSB, and NMFS in a pilot study to attach satellite tags to beluga whales in Alaska. In 1997, two ABWC representatives (one scientist, one hunter) participated in the highly successful joint MMS-FJMC tagging venture in the Mackenzie estuary. This study builds on a pilot study initiated in July 1998, during which tags were successfully placed on belugas at Point Lay. Whales monitored during the pilot study, predominately adult males, summered in the Beaufort Sea and Arctic Ocean. Additional data is needed on adult females and juveniles to test whether this trend is for all demographic classes of the eastern Chukchi Sea stock. This cost-effective, cooperative study

combines resources from the ABWC, ADF&G, NSB, UAF and MMS. MMS would contribute less than 30 percent of the estimated total cost.

Objectives The objectives of this study are to:

1. Develop a cooperative study to capture and satellite tag beluga whales from the eastern Chukchi Sea stock at Pt. Lay. Cooperators in this study will be the ABWC, ADF&G, UAF, NSB, MMS, and other interested parties as appropriate.

2. Determine seasonal movements and diving behavior of the Chukchi Sea and eastern Bering Sea beluga whales. Determine which regions of the pack ice they use after leaving coastal summer concentration areas. Determine whether age- or sex-specific differences exist in habitat use.

Methods Satellite-linked tags will be applied to beluga whales during summer/fall at Pt. Lay in the Chukchi Sea. The tags will be designed to give frequent, periodic locations along with time and date of transmission, in addition to data about dive depth and duration. Data will be downloaded into a GIS (ARC/INFO) database and displayed and analyzed along with sea-ice information. Dive depth tags will be evaluated against a detailed bathymetric grid.

Importance to MMS The study will:
1. Increase our knowledge of the migratory movements, wintering behavior, and feeding areas of belugas in Arctic waters.
2. Be used in support of environmental assessments for Arctic lease sales.
3. Provide especially pertinent information relative to protection of marine mammals and subsistence as required with the Marine Mammal Protection Act.
4. Be needed for post-sale mitigation and exploration plan reviews.

Date Information Required: The study will provide information to support proposed lease sales in the Beaufort and Chukchi Seas and monitoring. Interim reports will be available to MMS following each tagging season. Real-time location data for tagged belugas will be available to all cooperating parties throughout the project.

Revised Date: June 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Competitive

Title: Analysis of Covariance of Human Activities and Sea Ice in Relation to Fall Migrations of Bowhead Whales

Actual Costs (in thousands): **Period of Performance:** FY 2003-2004
FY 2002: In Procurement, TBD

Description:
Background Comprehensive analysis of the potential effects on bowhead whales of oil-industry activities has been limited by the resolution of data available on these activities and by disparate survey methodologies used to obtain whale data. Quantitative data on historical human/industrial activities and sea ice in the Alaskan Beaufort Sea will become available upon completion of the study ìReference Manual and GIS Overlays of Oil-Industry and Other Human Activity (1970-1995) in the Beaufort Seaî, to be completed in 2000. This follow-on study will compare that information with available bowhead distributional and behavioral data. Specific hypotheses will be tested to determine statistical significance of relationships of key variables.

Objectives The goal is to determine the significance of hypothesized relationships of previous oil-industry activity and sea ice on the Beaufort Sea distribution and behaviors of bowhead whales. Specific objectives are to:

1. Assess the comparability of bowhead whale data collected by site-specific and broad-area surveys and the feasibility of pooling these data to detect whale distributional shifts or behavioral changes up to 40 miles from noise sources.

2. Obtain from available information appropriate measures of sea ice for covariant analysis with whale distribution data.

3. Present preliminary tests and findings, define biases and assumptions, and recommend appropriate statistical procedures (e.g., analysis of covariance, regression techniques, K-S tests, spatial analysis, computer modeling) to a Scientific Review Board.

4. Apply applicable procedures to test hypotheses on relationships of the timing, location, and activity status of oil-industry/human activity and the distribution and behavior of bowhead whales (1979-1998).

Methods

1. Utilize existing data in the recently developed MMS database for Beaufort Sea human activity and data in the MMS Bowhead Whale Aerial Survey Project database.

2. Consider positions and daily activity status of each drilling platform, helicopter, icebreaker, and other support vessels.

3. Adopt similar measures between years to facilitate inter-year comparisons and trend analysis.

4. Control for presence of commercial vessels, subsistence hunting, and low-flying aircraft.

5. Evaluate site-specific and wide-area data from MMS- and oil-industry-funded surveys of the fall distribution of bowhead whales (1979-1998) for applicability and pooled analysis.

6. Using appropriate inferential statistical procedures, test hypotheses for significant relationships of human activities and bowhead distribution and evaluate power of tests.

7. Produce a final report suitable for a wide audience, including North Slope subsistence whaling villages.

Importance to MMS Information from the study will be valuable to the consultative process under the existing stipulation on subsistence whaling and other subsistence activities (Stipulation No. 5, Sale 170). It addresses:

1. Long-standing concerns about oil-industry activity raised by subsistence whale hunters.

2. Site-specific information needs expressed by oil-industry representatives at previous government workshops on developing site-specific monitoring guidelines.

3. Important study recommendations made at the Arctic Seismic Synthesis and Mitigating Measures Workshop (Barrow, Alaska, March 1997).

Date Information Required: Study information is needed for the proposed Beaufort Sea Multi-Sale EIS and for post-lease permit approvals for all Beaufort Sea sales (Sales BF, 71, 87, 97, 124, 144, and 170).

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: All Alaskan Planning Areas

Type: USGS Biological Resources Division or Interagency

Title: Alaska Marine Mammal Health and Contaminants Website

Actual Costs (in thousands): **Period of Performance:** FY 2002-2003
FY 2002: In Procurement, TBD

Description:
Background The Alaska Marine Mammal Tissue Archival Project (AMMTAP) was funded by Minerals Management Service (MMS) in 1987 as part of National Oceanic and Atmospheric Administrationís (NOAA) Outer Continental Shelf Environmental Assessment Program. Initial AMMTAP objectives were to develop methods for field sampling and long-term storage of frozen tissues (under optimal environmental conditions). This study, now conducted for MMS by the US Geological Survey (USGS) Biological Resources Division (BRD), in cooperation with the NOAA Fisheries Office of Protected Resources and the National Institute of Standards and Technology, became the model for a nation-wide tissue archive. Analysis of tissue aliquots, a routine quality-control measure at AMMTAP, provides a wealth of information on potential contaminants but this information is not digitally available to management agencies and subsistence villagers. The proposed website would also include ìhot-keysî that link with other Alaskan data repositories, thus facilitating rapid access by users to synoptic analytical data on marine mammal tissue. Such repositories include those maintained by the Native Science Commission on Alaska subsistence species and the Alaska Frozen Tissue Collection (AFTC). Once established, a website for AMMTAP data would be coordinated with regional (SynCon), national, (Agency for Toxic Substances and Disease Registry), and international (Arctic Monitoring and Assessment Programme) contaminant and health-related projects and would be maintained through existing AMMTAP funding

Objectives The primary goal is to enhance the availability of published and unpublished contaminant data on Alaskan marine mammal tissues for more immediate use by scientists and subsistence hunters.

Methods
1. Incorporate published and unpublished AMMTAP data into a web-linked relational database.

2. Provide links to additional contaminant and histopathological data on Alaskan marine mammals.

3. Create and demonstrate a menu-driven interface for agency managers, scientists, subsistence villagers, and other user groups in a searchable user-friendly format.
4. Include mapping features of sampling locations.

The AMMTAP website will be developed as the initial point of public access to the database as well as a link for related websites of partner agencies who will include reciprocal links to the AMMTAP site from their respective pages. Data linkages could potentially be established between State health agencies, Environmental Protection Agency, US Fish and Wildlife Service, and USGS-BRD. Histopathology data using Systematize Nomenclature of Medicine (SNOMED) adapted by the USGS National Wildlife Health Center, will also be made web-accessible. Metadata on AMMTAP results will also be accessible to website users.

Importance to MMS Questions about how oil-and-gas drilling and petroleum may potentially affect animal health, environmental contaminant loads, and the safety of consuming subsistence species are of vital importance to MMS and its constituents. The study provides readily accessible information on contaminant analyses directly to subsistence-hunting villages and other users.

Date Information Required: The information made accessible by this effort will be necessary to address concerns raised in EISís for future coastal and offshore developments.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea and North Slope

Type: Interagency or Competitive

Title: Demography and Behavior of Polar Bears Feeding on Stranded Marine Mammal Carcasses

Actual Costs (in thousands): **Period of Performance:** FY 2002-2003
FY 2002: In Procurement, TBD

Description:
Background: In the Beaufort Sea, polar bears make extensive movements between the United States and Canada. Alaskan polar bears spend most of the year on the drifting pack ice, but in late summer and fall, polar bears travel along the coast and barrier islands of Alaska and have been observed feeding on stranded marine mammal carcasses. In recent years large numbers of polar bears congregate at whale harvest sites near Kaktovik, Barrow, Cross Island, and barrier island complexes along the Beaufort Sea. In addition, an increase in polar bear numbers and a seasonally earlier and more protracted use of the Beaufort Sea coastline and barrier islands in Alaska have been noted in recent years.

Certain sex-age classes of polar bears may use beached marine mammal carcasses more frequently than other sex-age classes. Studies by Canadian scientists indicate that on sea ice, independent yearlings, subadults, and family groups may be displaced from their kills by larger, more dominant bears (Stirling 1974). Stranded marine mammal carcasses may provide an important alternative food source to animals unable to compete with dominant male polar bears for their primary food source, ringed seals. Marine mammal carcasses may also be important during periods of a polar bearís life cycle when energetic demands are increased. Examples are females with increased energetic costs associated with milk production for cubs and younger bears with increased metabolic needs associated with growth. Bears in these situations are more likely to become nutritionally stressed (Lunn and Stirling 1985).

Recent estimates of potential mortality of polar bears due to oil spilled from OCS developments (appended to the Liberty Draft EIS) suggest that most mortality of bears due to spilled oil is likely to occur among bears concentrating on or near barrier islands. For the latter analysis, bears on islands were assumed to be exposed to spilled oil and thus, die. This assumption was applied because existing telemetry data are not sufficiently accurate to allow determination of how bears allocate time between terrestrial and open water habitat. However, bears remaining on land when oil is present are obviously at much lower risk than bears entering water. Estimates of bear mortality due to oil spills would be more realistic and have greater utility if they incorporated information on patterns of use of land versus water habitat (and associated risks) by bears

forming the concentrations discussed above. This relationship is especially important since the most vulnerable class of bears is likely to be demographically important females.

No systematic observations have been conducted to quantify the level of use or potential importance of marine mammal carcasses to certain age and sex classes of polar bears. Little information is available to assess how bears consuming carcasses allocate time between land and water habitat. If such information were available it would be particularly useful for oil spill risk assessment. For example, if bears consuming carcasses tend to remain on land for extended periods (ie. days) while alternating feeding and resting, and not enter adjacent water, they are likely to be at less risk to exposure to encroaching spilled oil than bears that frequently enter water.

Objectives: The purposes of this study are to identify the magnitude of interchange of bears to and from feeding sites, the sex/age composition, utilization patterns, and behaviors of polar bears using beach cast marine mammal carcasses along the Beaufort Sea coastline in Alaska.

Methods

1. Monitor polar bears feeding on the remains of a hunter-harvested bowhead whale carcasses at Kaktovik and other locations along the Beaufort Sea coastline.

2. Conduct observations with binoculars and spotting scopes during daylight hours for up to 30 days to determine the exchange rates, sex/age composition, activity budgets, habitat use, and behavior of bears at the feeding site.

3. Complement these observations by information on utilization patterns and demography obtained from various aerial surveys conducted by MMS and industry.

Importance to MMS: Oil and gas operations on the Coastal Plain of the Beaufort Sea are ongoing and expanding to offshore areas. Recent EISís (e.g., Northstar) have highlighted the need for additional information on polar bear use of coastal habitats. Estimating the number, sex, and age class of polar bears using marine mammal carcasses will help managers document and evaluate the ecological significance of coastal areas to polar bears. Results from this study can also be used to implement measures that decrease impacts of human activities on polar bear feeding habitat and minimize human interactions with polar bears.

Date Information Required: Information from this study will be used for EISís and EAís for Arctic lease sales, post-sale mitigation, and exploration plan reviews.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea

Type: Joint Funding

Title: Polar Bear Population Monitoring Workshop

Actual Costs (in thousands): **Period of Performance:** FY 2002-2003
FY 2002: In Procurement, TBD

Description:
Background Offshore oil and gas development is increasing, as evidenced by Northstar, Liberty and other prospects, yet their cumulative impacts on polar bear populations remain largely anecdotal, or unknown. A comprehensive integrated approach to monitor the effects of development on polar bears is warranted.

The Marine Mammal Protection Act allows for the incidental take of polar bears by oil and gas activities provided that the sum total of effects results in a negligible effect to populations. The incidental take regulations are important to oil and gas operators in protecting personnel and protecting polar bears. They also provide a mechanism for monitoring effects of activities on polar bears and to minimize the chance of incidental take. In the past, potential impacts from specified activities have been monitored on a case-by-case basis; however, no long term monitoring program exists to evaluate the cumulative effects of industrial activities on polar bears in the Beaufort Sea.

Population research on polar bears has been conducted in Alaska since 1968 and has yielded valuable information regarding population ecology, den ecology, recruitment and survival, and habitat use by polar bears. Yet this information is fragmented and was not collected in a manner designed to specifically monitor the effects of human activities on polar bears or their primary prey, ringed seals. Results from these studies and additional studies conducted in the future may form a basis for a long-term monitoring program. A monitoring program should evaluate potential long-term direct and subtle effects of human activities on polar bear populations, their prey, habitat, and use of important habitats in consideration of natural variation inherent with the population dynamics of polar bears.

Objectives Hold a workshop to identify the components and structure for a polar bear population monitoring program needed in order to more accurately assess the effects of oil and gas development on polar bears in the Beaufort Sea area.

Methods MMS would pay up to 25% of the costs of a facilitated workshop to be held in Anchorage that would include scientists and managers with expertise in: impact assessment; polar bear ecology (including feeding ecology); habitat evaluation procedures; and population

monitoring. The lead agency (either USFWS or BRD) would be responsible for preparing a monitoring plan incorporating the consensual recommendations of the attendees.

Importance to MMS EISís and EAís for OCS Leasing and other OCS activities require an assessment of the effect of the activities upon the resources identified. Implementation of a suitable monitoring program will enhance efforts to understand the effects of disturbance and other forms of incidental take related to polar bear habitat quality and use, prey availability, and population recruitment and survival. Development of a monitoring plan would help to manage mineral resources in an environmentally sound manner, and to more clearly predict the effects of oil and gas activities and thus to minimize the effects of these activities on polar bears.

Date Information Required: Information from this study will be used in EISís and EAís for Arctic lease sales, post-sale mitigation, and exploration plan reviews.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Update Oil Industry Labor Factors for Alaska Manpower Model

Actual Costs (in thousands)
FY 1998- $132
FY 2000- $ 11
Total Cost: $143

Period of Performance: FY 1998-2002

Organization Conducting: Jack Faucett & Associates

Description:

Background The Manpower Model was created in the late 1970's and early 1980's to project the number of workers directly employed in proposed OCS exploration and development activities. This data is used in another model to predict secondary employment and population. The employment data from the Manpower Model and the secondary employment and population data are used in EIS's. The input factors to the Manpower Model were based on information, no more current than the early 1980's, from industry on the actual number of workers used for 20 different tasks and numerous subtasks through the full range of activity from exploration and development to production. Technology has changed sufficiently that the input variables to this model should be re-examined and adjusted. The employment and population projections in recent EIS's do not reflect current industry practices and technology. Information about current industry practices is best obtained from industry representatives and consultants to industry.

Objectives The objective of this study is to update the Manpower Model with input variables that accurately reflect the number of workers needed to complete tasks associated with exploration, development, and production on the OCS.

Methods

1. Interview industry representatives and possibly knowledgeable consultants to the oil and gas industry

2. Determine number of workers and amount of time needed to complete the tasks and subtasks defined in the Manpower Model.

3. Determine costs by task.

4. Input these updated oil- industry-labor and cost factors to the Manpower Model.

5. Test the Manpower Model to ensure it is functioning properly with the updated factors.

6. Document the factors and the model.

The current Manpower Model has one set of factors for all of Alaska. The update will be for Arctic operations only.

Importance to MMS Projections of direct OCS employment, secondary employment, and population in Arctic region EIS's will be more accurately reflected. With more accurate projections, stakeholders will have more confidence in the economics sections of the EIS's. More accurate projections may be used in decisions regarding postlease mitigation.

Date Information Required: The model will be used for the proposed Beaufort Sea Multi-Sale.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Contract

Title: Collection of Traditional Knowledge of the Alaskan North Slope

Actual Costs (in thousands):
FY1997 - $142
FY1998 - $110
FY1999 - $120
FY2000- $44
Total Cost: $416

Period of Performance: FY 1997-2002

Conducting Organization: Ukpiagvik Inupiat Corporation

Description:
Background The Native people of Arctic Alaska have many years of experience in living in Arctic environments and have much knowledge on the biological and physical environment of both the marine and terrestrial ecosystems. Much of this knowledge has been passed on from one generation to the next by word of mouth. Little of it is in published form and even less is indexed. Much traditional knowledge has, however, been written, audio-recorded, archived and, in some cases, published. But because there is no index of this traditional knowledge, it is often not available to the scientific community.

Objectives

1. Locate, collect and organize all ìtraditional-knowledgeî information associated with the Alaska North Slope Borough (NSB). These encompass oral-history-taped interviews, written transcripts, published sources, and textual and video records. An important source is CD ROM ìjukeboxesî produced for the NSB by the Alaska Oral History Project at the University of Alaska-Fairbanks (UAF) of elder interviews and Eldersí Conferences.

2. Identify key traditional-knowledge indices for structuring and abstracting.

3. Prepare a PC-based CD-ROM containing an annotated bibliography, abstracts, traditional knowledge indices and findings of this study.

4. Prepare an Inupiat epistemology.

Methods Identified traditional-knowledge sources will be judged appropriate for inclusion in the traditional-knowledge database based on a review by community elders, subsistence coordinators on staff with the NSB, Inupiaq Language and Cultural Center personnel, Inuit Circumpolar Conference, and members of the North Slope Scientific Committee. The identified information will be indexed and, with an annotated bibliography and abstracts, placed on a CD-ROM. The CD-ROM will be disseminated to Native communities and State of Alaska, Federal, and local governments involved in environmental research and assessment. At a minimum, the proposed database will encompass subsistence areas; harvest methods; relationships between physical environment and animal populations and behavior; bowhead whale behavior, movement, and distribution; ice conditions and movement; wind patterns; current patterns; and place-name information. Quality assurance will be accomplished for all significant steps of the project

Importance to MMS Public input has very strongly recommended that MMS and other government agencies incorporate traditional Native knowledge in our documents. MMS will use the products of this study to address OCSLA requirements, assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, facilitate outreach with North Slope communities regarding the MMS program, and review and formulate offshore policy for Alaska. While this study focuses on the North Slope, the process used could serve as a prototype for a similar study in all areas of Alaska.

Date Information Required: Interim products will provide information for the proposed Beaufort Sea Multi-Sale EIS. The final products will be used for NEPA documentation for future Beaufort Sea Lease Sales and development plans and programs.

Revised Date: June 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Publication of a Book/Synthesis on the Socioeconomic Effects of Oil and Gas Industry Activity on the Alaska OCS

Actual Costs (in thousands):
FY1998 - $349
Total Cost: $349

Period of Performance: FY 1998-2002

Conducting Organization: Stephen Braund & Associates

Description:
Background The Alaska OCS Region has implemented an important socioeconomic component of its overall Environmental Studies Program, resulting in the publication of more than 160 Technical Reports (TRís) addressing statewide socioeconomic study topics. Methodologies have included case studies, institutional profile analysis and analysis of secondary-source materials, modeling and econometrics analysis, and survey research. In recent years, socioeconomic studies have become more focused and issue-oriented, emphasizing the critical points between OCS development and social systems with which potential development would interact. For example, studies have collected time-series information and measures of community and regional well being as bases for social-indicators monitoring.

Considering the extent of MMSís social research in Alaska and the substantial information accumulated, a workshop examining the usability of the current research in its original forms versus the costs and benefits of further synthesis was recently conducted. In planning for the preparation of a useful resource document resulting from the workshop efforts, the workshop participants identified a tentative outline, chapter integration, and potential co-sponsors.

The level of information regarding changes in the socioeconomic environment related to OCS activities is variedówithout a comprehensive formal, comparative, quantitative, and qualitative documentation of existing data, this information is of limited use to decision makers.

Objectives The objective of this study is to coordinate and prepare a peer-reviewed book/synthesis of available information about the potential socioeconomic effects of oil- and gas-industry activity on the Alaska OCS.

Methods The study will finalize the book/synthesis outline; integrate chapters; identify the author; and solicit potential co-sponsors. MMS funded studies will be the primary source of

reference materials plus subsequent studies that were initiated from these findings. To be considered as source material, the literature must be related to oil and gas activities in Alaska and peer-reviewed. The topics to be addressed will be narrowed specific to the information available through this literature search which will also serve to identify potential authors. These authors may also identify additional sources of information for synthesis.

Importance to MMS Throughout Alaskan coastal communities there are socioeconomic-related issues resulting from those who favor resource development and those who want no risk of resource development. This study will provide a peer-reviewed synthesis of current information for use in decision making. The MMS foresees using the products of this study to assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, outreach with coastal communities regarding the MMS program, and review and formulate offshore policy for Alaska.

Date Information Required: The study will provide information for NEPA documentation for future Beaufort Sea Lease Sales and development plans and programs and ongoing outreach efforts, and for future socioeconomic-study proposals.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive

Title: Quantitative Description of Potential Impacts of OCS Activities on Bowhead Whale Hunting and Subsistence Activities in the Beaufort Sea

Estimated Cost (in thousands): $400 - $600 **Period of Performance:** FY 2001-2003

Organization Conducting: EDAW, Inc.

Description:
Background The residents of Nuiqsut, Kaktovik, and Barrow are close to the oil industry activity onshore on the North Slope and in the adjoining Beaufort Sea. Subsistence is central to the Inupiat people residing on the North Slope. Virtually all Inupiat residents rely on subsistence resources directly or through kinship sharing. Bowhead whaling is especially important and impacted if OCS activity causes reduction in whale hunting success. Inupiat leaders, including elders, have expressed concern about the effects of potential oil spills on bowhead whaling and cumulative impacts of past, present and future oil industry activity onshore and offshore. At a meeting in Barrow in March 2000 elders defined two principal questions concerning cultural, social and economic impacts:

A. Regarding offshore oil and gas activities, do people in Barrow, Nuiqsut and Kaktovik feel that these activities have: a) resulted in positive social, economic or cultural impacts to their community, and/or b) resulted in negative social, economic or cultural impacts to their community?

- If members of a community feel there have been positive social, economic or cultural impacts to their community, what are the positive impacts and how can they be quantified?

- If members of a community feel that there have been negative social, economic or cultural impacts to their community, what are the negative impacts and how can they be quantified?

B. What kind of support would need to be put in place to enable Alaskan Eskimo subsistence communities to continue subsistence activities and keep traditional subsistence ways of life intact in the event of an oil spill or cumulative impacts (including air and/or water pollution and noise) that make subsistence resources locally unavailable?

Several studies have been done which address certain aspects of potential sociocultural impacts on the North Slope. This study would update some older studies and provide information not previously collected in other aspects.

Objectives To quantitatively estimate the social and cultural impacts of OCS oil and gas exploration, development, and production in the Beaufort Sea on the communities of Nuiqsut, Kaktovik, and Barrow; and to recommend mitigation measures.

1. Identify what people observe and anticipate as the positive impacts and opportunities of OCS activities.

2. Identify what people observe and anticipate as the negative impacts and risks of OCS activities.

3. Quantitatively describe direct impact experiences and anticipated experiences by bowhead hunters.

4. Document actual experiences and match the impact with the reporting unit experiencing the impact (e.g., whaling crews, households, individual hunters, elders).

Methods

1. Review the literature, including previous testimony, and make a preliminary list of North Slope impacts and concerns expressed by residents (positive and negative). Review the methodologies and survey questionnaires used in the social indicator studies conducted by MMS in the 1990's for possible use in this study. Gather a thorough list of residents' observed and anticipated impacts and concerns through focus group meetings in Nuiqsut, Kaktovik, and Barrow. Potential impacts would likely include, among others, pollution, noise, and other factors that may make bowhead whales and other marine resources more difficult to hunt or unavailable. Collect information on residents' views of possible remedies or mitigation measures related to those concerns and impacts. Design the list of impacts in such a way as to separate OCS-related impacts from other impacts as much as possible. Circulate this list of impacts and mitigation possibilities to the NSB, AEWC, village contacts as appropriate, and MMS.

2. Use the literature and focus group data to develop a draft questionnaire. Distribute that questionnaire to the NSB, AEWC, SRB, village contacts, and MMS for review and comment. Pretest the questionnaire (N<10) in the communities, make revisions as appropriate, and re-circulate the questionnaire for final review. Obtain approval from the Federal Office of Management and Budget (OMB) as required for federally funded questionnaires, estimated to take 6-8 months. Develop interviewer guides (question by question, tracking, and reporting procedures) and conduct an interviewer training session.

3. Coordinate with NSB, AEWC, and community contacts to enable face-to-face interviews in Barrow, Nuiqsut, and Kaktovik. Due to its large size and socio-demographic heterogeneity,

use a stratified, representative, and randomized sampling strategy in Barrow. Attempt to interview randomly selected adult members in all households in Nuiqsut and Kaktovik, with the expectation of a response rate of over 80 percent. Select a subsistence-oriented Arctic or sub-Arctic control community outside of the North Slope and conduct a representative and randomized sample of interviews there. Ideally, members of the control community will hunt bowhead whales.

4. Code the surveys, enter data into SPSS (or equivalent statistical package), check, and edit. Use basic univariate and bivariate analyses to generate valid and reliable descriptive information for inclusion in summary tables and graphs, and to provide quantitative-oriented but readily understandable descriptive discussion in the draft and final reports. Use multivariate analysis to explain variation in the data and to provide quantitative-oriented but readily understandable explanatory discussion in the draft and final reports. Draw from findings about respondentís ideas for potential mitigation measures to develop a draft recommendation section.

5. Develop a draft report and present it to the AEWC, NSB, SRB, and village contacts in Nuiqsut and Kaktovik for extensive input and commentary.

6. Finalize the draft report based on the input and commentary of interested parties and present and disseminate study findings to those parties.

7. Coordinate all steps above with other potential planned studies.

Importance to MMS MMS will use the products of this study to address OCSLA requirements, assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, facilitate outreach with North Slope communities regarding the MMS program, and review and formulate offshore policy for Alaska. Leaders of the North Slope Inupiat communities, including elders, have for many years expressed concern about impacts to their subsistence way of life. These concerns were expressed most recently during a meeting held in Barrow in March 2000. This study is important in its capacity to effectively measure and document such concerns and for its potential utility in future decision-making processes.

Date Information Required: This information is needed as soon as possible for potential use in ongoing NEPA analyses and formulation of mitigation measures.

Revised Date: June 2002

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ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive/Possible Joint Funding

Title: Subsistence Mapping at Nuiqsut, Kaktovik, Barrow, and Wainwright: Past and Present Comparison

Actual Costs (in thousands): **Period of Performance:** FY 2002-2004
FY 2002: In Procurement, TBD

Description:
Background MMS conducted studies providing detailed mapping of a wide range of subsistence activities for Nuiqsut, Kaktovik, and Barrow about 1990. Information is available from recent subsistence scientific, private, and government sources. For example, Alaska Department of Fish and Game (ADF&G) has done some detailed mapping of subsistence activities for these three North Slope s villages since 1990 but the mapping needs to be put in usable form. MMS assesses cumulative effects in EISís and, therefore, needs documentation on more current subsistence patterns for comparison between 1990 and the present. Exploration on the offshore, including the OCS, and much onshore development has taken place since 1990. Much oil and gas infrastructure has been built onshore since 1990. Northstar is the first offshore oil development connecting to the onshore developments centered at Prudhoe Bay and it began production in 2001. The Liberty development, if approved, would be the first on the Beaufort Sea OCS. In general, exploration and development activities have directly affected Nuiqsut most significantly, followed by Kaktovik and then Barrow. This study will coordinate with the documentation of subsistence activities at Cross Island, which is part of the ongoing ìArctic Nearshore Impact Monitoring In Development Areasî (ANIMIDA) study. It may utilize information from the ongoing study titled ìReference Manual and GIS Overlays of Oil-Industry and Other Human Activities (1979-1998) in the Beaufort Sea.î

Objective Develop a Geographic Information System (GIS) to map and analyze changes in and potential interactions between subsistence activities and oil industry activities.

Methods
1. Consult with key organizations to refine the scope of work for the study and to plan for conduct of the study. Such organizations may include the North Slope Borough Planning and Wildlife Management Departments, Alaska Eskimo Whaling Commission (AEWC), Inupiat Community of the Arctic Slope, the Native Villages of Barrow, Nuiqsut and Kaktovik, and ADF&G Subsistence Division, and others as appropriate

2. Compile information regarding subsistence geospatial patterns from MMS sponsored and other studies conducted in Nuiqsut, Kaktovik, Barrow and Wainwright during the 1990s.

Assess the quality of existing geo-spatial data and convert to GIS format where possible. Include data from the ADF&G Individual Harvest-Area Maps and Key Informant Mapping Project completed for MMS.

3. Compile current information on subsistence activities and use of resources for Nuiqsut, Kaktovik, Barrow, and Wainwright as available from recent work conducted by scientific, private, and government entities. Gather primary source data regarding current subsistence effort, and use of resources from knowledgeable key informants resident in Nuiqsut, Kaktovik, and Barrow. These data may be acquired through scoping meetings, focus groups, and in-person interviews. The data collection effort will coordinate with other MMS studies such as ìQuantitative Description of Potential Impacts of OCS Activities on Bowhead Whale Hunting and Subsistence Activities in the Beaufort Sea,î and the ìTraditional Knowledge/Western Science Bowhead Whale Seasonal Migration Report.î

4. Generate maps depicting where subsistence activities are currently taking place and at what level of intensity. Products will show potential changes in:
   - -- Harvests
   - -- Access to resources
   - -- Competition for resources
   - -- Costs
   - -- Effort
   - -- Levels of risk

5. For each subsistence activity map, provide context describing in standardized and specific terms the nature and source of the data

6. Illustrate on maps the location, nature of, and changes onshore and offshore oil industry infrastructure for 1990, a mid-point year, and the most current year. Depict exploration activity, including seismic exploration and drilling by year since 1990 to the present.

7. Develop overlay maps depicting changes in subsistence activities and changes in oil and gas activities. Develop analysis to address potential cumulative-effect dynamics occurring between subsistence and oil and gas activities. Develop descriptive context to augment the analysis.

8. Review and evaluate effectiveness of current federal and state mitigation associated with oil and gas activity regarding potential displacement of subsistence resources and resource users

9. Review graphic and written analysis with key informants and key organizations including but not limited to those identified in 1 above. Disseminate ongoing and final products of study to local residents through village workshops and integrate workshop feedback into the final analysis.

10. Input all final spatial information on subsistence and industry activity into a Geographical Information System.

11. Make resulting information available to the public on CD-ROM.

Importance to MMS MMS will use the products of this study to address OCSLA requirements, assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, facilitate outreach with North Slope communities regarding the MMS program, and review and formulate offshore policy for Alaska.

Date Information Required: The information is needed for NEPA documentation for proposed lease sales in the *Final Proposed Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* (July 2002) and for development plans.

Revised Date: June 2002

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ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas and Hope Basin

Type: Competitive

Title: North Slope Borough Economy, 1965 to Present

Actual Costs (in thousands): **Period of Performance:** FY 2003
FY 2002: In Procurement, TBD

Description:
Background The focus of the social and economic studies of the MMS Alaska OCS Region has been the potential for increase in offshore oil and gas activity. Many MMS socioeconomic studies were based on scenarios of change from no-industry activity to development-stage activity. However, through 1999, industry activities in all Alaska OCS leased areas had gone only to the exploratory phase, and industry activities onshore in Alaska currently are in decline. Although there was much greater production in the 1980ís, reduced production at Prudhoe Bay fields in the 1990ís and attractive international exploration and development opportunities are additional factors affecting property tax revenues to the North Slope Borough (NSB). This historical economic activity and its effect on NSB revenues/expenditures, provides a context for anticipated offshore development and production at Northstar and, if approved, Liberty and their potential effect on regional and local economies. A descriptive characterization of historic and recent North Slope economic activity due to onshore activities is necessary in order to evaluate relative significance of projected offshore development. The anticipated decline in oil production may be offset to a degree by production of natural gas from Prudhoe Bay and surrounding fields. The major oil and gas companies are seriously considering natural gas production as of the year 2001. This could increase the NSB revenues.

Objectives
1. Describe revenues and expenditures of the NSB, 1965 to the most current year available.

2. Portray how the NSB, as the local government, and individuals and households anticipate dealing with decline in revenues from the oil industry.

3. Describe the structure of NSB economy and changes to the structure, 1965 to the most current year available.

4. Describe the role of the regional Native corporation in the economy.

5. Provide a comparative basis for assessing potential economic effects of upcoming offshore oil and gas activity.

Methods

1. Make a quantitative and narrative description of NSB revenues and expenditures for each year from 1965 through the most current year available for capital projects. Classify local government services by departments of the NSB and other major categories.

2. Using the institutional profile analysis method focusing on key informants, determine how the NSB, as the local government, anticipates responding to a decline in revenue.

3. Also using key informants, determine how individuals and households anticipate responding to a possible economic change, such as doing more subsistence hunting or moving to areas in Alaska where cash jobs are available. Focus on the family (households), personal income, and sources of income for the families.

4. Using data from the NSB and State Department of Labor, describe the structure of the NSB economy and changes, 1965 to the most current year; i.e., employment by sector of the economy and employer. Analyze local jobs and the types of jobs. Describe the flexibility of jobs in relation to subsistence (for example, getting time off to engage in subsistence. Using the best data available, describe in- and out-migration).

5. Describe the role of the regional Native corporation, Arctic Slope Regional Corporation, in the North Slope Borough economy. Depict its role both in quantitative and narrative form.

6. Coordinate the study with NSB officials, as needed.

Importance to MMS This study will be useful to MMS in assessing potential economic impacts of OCS development activity on the NSB a and NSB residents with respect to revenues and expenditures, employment, subsistence and migration. It will provide a region-wide perspective of the economic effects of recent on-shore oil and gas development against which upcoming OCS economic effects may be gauged.

Date Information Required: This information will be used for EISís and EAís Beaufort Sea and Chukchi Sea Lease Sales in the *Final Proposed Outer Continental Shelf Oil and Gas Leasing Program 2002 to 2007* (July 2002).

Revised Date: June 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Contract

Title: Reference Manual and GIS Overlays of Oil-Industry and Other Human Activity (1979-1998) in the Beaufort Sea

Actual Costs (in thousands): **Period of Performance:** FY 1998-2002
FY1998 - $210
FY1999 - $47
Total Cost: $257

Conducting Organization: LGL Limited Environmental Research Associates

Description:
Background Analysis of the potential effects on wildlife of oil-industry and other human activities has been limited by the quality and resolution of data available on these activities. This study will provide wildlife scientists, Native organizations, and others with the authoritative historic information on human activity needed to analyze the potential effects of such activities on whale migrations, wildlife distributions, shipwrecks, etc.

Objectives
1. Quantify offshore drilling, seismic exploration, vessel- and helicopter-support activity in the Beaufort Sea in small units that are comparable between areas and years (e.g., line miles shot by area).
2. Quantify other human activity in the Beaufort Sea such as number and types of commercial vessels, subsistence hunting, and aircraft on an annual basis, specifying when and where such human activity occurred.
3. Compile measures for the above human activities in an inter-year, cross-indexed reference manual and as ARC/INFO overlaysóboth useful for defining ìindustrialî versus control zones, in identifying between-year trends, and in comparing levels of various types of oil- industry activity with other human activities and wildlife distributions.

Methods
1. Inventory of all published and unpublished records of oil industry activities in Federal and State waters by year for the period 1979 to 1998 in the Alaskan Beaufort Sea. Records include, but are not limited to, Federal, State, oil industry, and oil-industry-support entities.

2. Compile and synthesize all legally available and nonproprietary records on vessel and on-ice seismic, drilling, production, and support activities by area, month, and year. Conduct a similar inventory of other vessel and low-level aircraft activity in or over the Beaufort Sea.
3. Describe the levels for each human activity in the smallest units possible to facilitate subsequent temporal and spatial comparisons between areas, months, and years.
4. Compile measures appropriate to each human activity in an inter-year, cross-indexed reference manual that includes a summary ARC/INFO overlay for each activity during each month and each year.
5. Provide Oracle/Spatial Database Engine (SDE) geospatial database, users and reference manuals, and training.

Importance to MMS Information from this study will be valuable to the consultative process under the existing stipulation on subsistence whaling and other subsistence activities (Stipulation No. 5, Sale 144). The study will provide the most authoritative source of oil-industry and other human geospatial activity available for the Beaufort Sea during the years 1979-1998. It would address in greater detail many of the concerns about oil-industry activity raised by non-industry groups relative to potential interference with subsistence hunting and whaling. Results of this study will be used to help resolve long-standing concerns over the potential effects of seismic activity.

Final products from the study will be important to decision makers, managers, and scientists for:
1. Making direct comparisons between oil-industry activities and the distribution of wildlife species (bowhead whale migrations, waterfowl, ringed seals) previously monitored in the Beaufort Sea.
2. Comparing drilling activity with monitored water chemistry and chemical contaminants found in archived marine-mammal tissues.
3. Determining potential effects on wildlife by better defining, delineating, and quantifying appropriate industrial-activity and control zones.

Date Information Required: This information is needed for evaluation of postlease exploration plans in the Beaufort Sea and to improve present and planned monitoring of the potential impacts of postlease activity on bowhead whales, ringed seals, and marine mammal tissues in the Beaufort Sea (respective to Sales BF, 71, 87, 97, 124, 144, and 170).

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Area: Beaufort Sea

Type: Competitive

Title: ANIMIDA - Arctic Nearshore Impact Monitoring in Development Area

Estimated Costs (in thousands):
FY1999 - $517
FY2000 - $832
FY2001 - $818
FY2002 - $750
FY2003 - $300
Total Cost: $3,217

Period of Performance: FY 1999-2004

Conducting Organization: Arthur D. Little, Inc.

Description:
Background Scientists, environmental groups, state and federal agencies and local residents are particularly concerned about long term effects of offshore developments at Liberty and Northstar as well as long term effects of any development from Lease Sale 170. Interagency reviews of related EISís and Development and Production Plans recommend monitoring impacts of Northstar and, if approved, Liberty. Current information on selected topics is available but likely to be out of date or not of sufficient geographic or seasonal focus to meet the needs of this effort.

This study gathers long term monitoring data which will provide a basis of continuity and consistency in evaluation of potential impacts from site-specific, recently initiated development and upcoming production in the Beaufort Sea. Priority monitoring issues have been determined through public and interagency comment, and coordinated with lessees and other organizations.

Objectives Due to the scale and scope of this study, the objectives are phased.
Phase I: Environmental Baselines:
- Review of recent literature for Liberty and Northstar areas
- Underwater/air noise and vibration
- Sediment quality
- Resuspension/deposition

Phase II:
- Task Order (TO) 1: Core Contractor Program Management, Logistics, Database and Reporting.
- TO 2: Hydrocarbon and Metal Characterization of Sediments, Bivalves and Amphipods in the ANIMIDA Study Area.

- TO 4: Annual Assessment of Subsistence Whaling Near Cross Island.
- TO 5: Sources, Concentrations, and Dispersion Pathways for Suspended Sediment in Areas of Oil and Gas Development along the Coastal Beaufort Sea.
- TO 6: Monitoring the Boulder Patch as Part of the ANIMIDA Program Phase II.
- TO 7: Partitioning of Potential Contaminants between Dissolved and Particulate Phases in Waters of the Coastal Beaufort Sea.
- TO 8: Baseline Characterization of anthropogenic Contaminants in Biota Associated with Alaska OCS Liberty and Northstar Oil and Gas Production Units in the Nearshore Beaufort Sea.

Methods Phase I, included focused literature review, planning, and pre-Northstar/Liberty-construction baseline effort focused on key physical environmental factors, including trace metal and hydrocarbon chemistry. Field logistics for both phases include helicopter support and small vessel (e.g. MMS Launch 1273) support in the ìopenî water season and snow machine/ rolligon support in winter/spring. Phase II (FYís 2000-2003) will include monitoring of Northstar construction and baseline effort for Liberty. The initial Phase II sediment sampling has a focus on the recently completed Northstar Island and pipeline. Source samples have been collected from construction gravel pits, artificial islands, rivers, and barrier islands and sediment from 42 offshore stations (old Beaufort Sediment Monitoring Program, Northstar, Northstar pipeline, and Liberty sites). Turbidity, total suspended sediment, current velocity measurements are being made in the vicinity of Northstar construction, spoils dumps and other sites including local rivers. Sediment and suspended sediment samples are being analyzed for PAH, trace metals, and supporting chemistry. Initial contaminant sampling of biota emphasizes fish. These and other biota are being analyzed for hydrocarbons and persistent organic pollutants. Kelp productivity will be monitored in the Boulder Patch starting in 2001 and will use the inherent optical properties of the ice and water to determine the impact of sediment resuspension on kelp productivity. Optical-related measurements will include spectral irradiance, light scattering coefficients, and total suspended solids. An experienced Arctic rural sociologist will be stationed on Cross Island during the whaling season and record the information on whaling locations, success, and whaler perceptions during the first field season. Subsequent years will have goal of working toward a self-reporting arrangement with the whalers. Field programs are also scheduled for 2001 and 2002. Year 5 (FY 2003) will be devoted to reporting of monitoring results.

Importance to MMS Northstar construction started during Phase I. Liberty, if approved, could start construction in 2003, with the EIS currently being written by the Alaska OCS Region. Development of these Units is generating public concerns regarding impacts on nearshore biota and environment.

Date Information Required: There is a continuing, ongoing need for this information during the performance period of the study and for monitoring potential effects Northstar and Liberty.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort and Chukchi Seas

Type: Competitive

Title: Statistical Approach to Alternative Oil Spill Occurrence Estimators for the Beaufort/Chukchi Sea OCS

Estimated Costs (in thousands): **Period of Performance:** FY 2000-2002
FY 2000 - $200
Total Cost: $200

Conducting Organization: Ted Eschenbach (Individual Contractor)

Description:
Background The U.S. Outer Continental Shelf (OCS) historical platform and pipeline crude oil spills are mostly from the Gulf of Mexico and Pacific OCS. This spill record does not include pipeline spills inshore of the OCS, in State waters or on land. The MMS Alaska OCS Region intends to calculate spill occurrence based on Regional considerations, such as Alaska North Slope and Arctic Canada rather than on the Gulf of Mexico and Pacific OCS experience, and to include all major pipeline spills, both onshore and offshore, in environmental impact assessment. The first step in this process was a prior study (OCS Study MMS 2000-007) in FY 1999-2000 to collate available information on crude and diesel spills of at least 100 bbl from the oil industry in the Alaska North Slope and Arctic Canada, verify spill information for spills of at least 500 bbl, and to estimate provisional occurrence rates for use in the nearshore Beaufort Sea OCS**.** Based on this prior study, MMS was able to extrapolate pipeline and facility occurrence rates for spills of at least 500 bbl from onshore oil spill experience to shallow coastal waters in the nearshore Beaufort Sea. The MMS found too few spills of at least 1,000 bbl to directly calculate occurrence rates for this size category.

The MMS Technology and Assessment (TAR) Program is approaching pipeline spill risk from an engineering view with ongoing studies for nearshore Arctic pipelines and Gulf of Mexico. Nonproprietary products from these studies will be made available to this study as they become available.

Objectives

1. Apply statistical procedures to develop occurrence rates for oil spills of at least 1,000 bbl from historical crude and diesel spills compiled for the Alaska North Slope and the Trans-Alaska Pipeline from Prudhoe to Valdez, excluding the marine terminal.

2. Evaluate the applicability of results from objective (1) to offshore lease tracts where water depths make gravel islands unlikely or infeasible.

3. Describe alternative approaches to estimating oil spill occurrence for Beaufort Sea and Chukchi Sea lease sales and development projects from spills of at least 1,000 bbl.

4. Develop appropriate occurrence estimators, choosing the best method from objective (3).

5. Provide professional support to MMS in regard to statistical issues of occurrence rates and estimator(s) related to this study and its results.

Methods

1. The spill data from the preliminary study and environmental exposure issues for the <200-m deep portion of Beaufort Sea Planning Area will be reviewed. The relevance of the spill data to areas in waters deeper than 20 m will be evaluated.

2. There are alternate approaches that can used to estimate spill rates in the absence of sufficient historical data. Alternative oil-spill frequency estimators suitable for predictive use in Beaufort and Chukchi Sea OCS will be evaluated, both in exploration and development phases. Draft oil spill rates based on the most appropriate estimators will be provided. The study will also quantify robustness of the statistics (Confidence Limits on spill frequency estimates), and quantify precision/variance of estimates of spill probabilities.

3. Forty hours of on-call statistical/professional support to MMS staff regarding use of the results of (2) will be provided.

Importance to MMS The Oil-Spill-Risk Analysis (OSRA) is a cornerstone to regional EISís, environmental assessments, and oil-spill-contingency planning. Oil-spill issues constitute a significant portion of public comments submitted on sale or development EISís in the Alaska OCS Region.

Date Information Required: Information from this study will be used in the proposed Beaufort Sea Multi-Sale EIS, future developmental EISís, and review of oil-spill-contingency plans for OCS and coastal facilities.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive

Title: Beaufort Sea and North Slope Pipeline GIS Database

Actual Costs (in thousands): **Period of Performance:** FY 2002-2004
FY 2002: In Procurement, TBD

Description:
Background The MMS has primarily used the historical spill record on the Outer Continental Shelf (OCS) as an indicator of future spill occurrence rates on the Outer Continental Shelf (OCS). This spill record does not include pipeline spills shoreward of the OCS, in State waters, or on land. The MMS intends to calculate spill rate occurrence based on Regional considerations, such as the Alaska North Slope production and pipeline experience, and to include all major pipeline spills, both onshore and offshore in environmental impact assessment. The first step in this process was a prior study (OCS Study MMS 2000-007) in FY 1999-2000 to collate available information on oil spills of at least 100 barrels (bbl) and to provide preliminary evaluation of spill occurrence rates.

One objective of this prior study that could not be accomplished was to evaluate usefulness of pipeline length as predictor or co-predictor (with pipeline throughput) for North Slope and Trans-Alaska Pipeline System (TAPS) spillage. This objective required concomitant pipeline segment throughput and pipeline segment length information at yearly or better intervals. The prior study did not have the available resources to collect the comprehensive data on field gathering lines necessary to complete the analysis. Construction of a database of that information base was beyond the scope of that study.

Objectives This study is in two Phases. Phase II will not be funded unless significant information is deemed obtainable through the efforts of Phase I.
Phase I
1. Establish how much of the construction history (length, location) and throughput history can be reconstructed from industry, government, mapping and/or other sources. Include onshore North Slope, offshore Beaufort, and TAPS pipelines.
2. Establish whether supporting information on pipeline segment characteristics (diameter, special protective measures, inspection measures, special spill detection measures, etc) can be obtained.
3. Develop a written plan for obtaining these data and placing them in a Geographical Information System (GIS) database.

Phase II
1. Implement the strategy developed in Phase I to obtain pipeline data.
2. Develop GIS database.

Methods

Phase I
1. Establish potential data sources and develop communications links.
2. Establish inventory of data and data sources.
3. Establish contacts for all known data sources.
4. Establish cooperative agreements with major potential users of the data.
5. Provide written permission to access the data.
6. Develop written plan for obtaining data and constructing GIS database.

Phase II
1. Implement strategy for obtaining data.
2. Implement strategy for constructing GIS database:
    - Consistent with the MMS corporate database structure.
    - Capable of point and click identification of specific pipeline segments and characteristics
    - Capable of display of existent pipeline by year.

Importance to MMS The Oil-Spill-Risk Analysis (OSRA) is a cornerstone to regional EISís environmental assessments, and oil-spill-contingency planning. Oil-spill issues constitute a significant portion of public comments submitted on sale or development EISís in the Alaska OCS Region. This information also provides a corner stone for analyzing the spatial extent of cumulative impacts of oil pipeline development through time.

Date Information Required: MMS will use the information from this study in preparing development EISís, lease sale EISís under the next 5-year schedule, and in reviewing oil-spill-contingency plans.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Cooperative Agreement with University of Alaska, Fairbanks

Title: Minerals Management Service/University of Alaska-Fairbanks/State of Alaska/Coastal Marine Institute - Management

Actual Costs (in thousands):
FY1998 - $101
FY1999 - $100
FY2000 - $112
FY2001 - $125
FY2002 - $125
Total Cost: $563

Period of Performance: FY 1998-2002

Conducting Organization: UAF CMI

Description:
<u>*Background*</u> This study provides management of a large ongoing program of scientific research into framework issues related to lease sales *Final Proposed Outer Continental Shelf Oil and Gas Leasing Program 2002-2007*, July 2002. It is a cooperative program between MMS and the University of Alaska, with State of Alaska participation. The Coastal Marine Institute (CMI) is expected to leverage additional scientific results and logistics capability at levels comparable to the MMS contribution. The Coastal Marine Institute will update and expand our understanding of OCS environmental information and address future needs related to the offshore oil and gas program in Alaska.

<u>*Objectives*</u> The purpose of the CMI is to generate scientific information for MMS and State of Alaska decision makers that is consistent with the needs outlined by the Framework Issues. The Framework Issues are:

1. Scientific studies for better understanding marine, coastal or human environments affected or potentially affected by offshore oil and gas or other mineral exploration and extraction on the Outer Continental Shelf (OCS).

2. Modeling studies of environmental, social, economic, or cultural processes related to OCS gas and oil activities in order to improve scientific predictive capabilities.

3. Experimental studies for better understanding of environmental processes, or the causes and effects of OCS activities.

4. Projects which design or establish mechanisms or protocols for sharing data or scientific information regarding marine or coastal resources or human activities in order to support prudent management of oil, gas and marine mineral resources.

5. Synthesis studies of scientific environmental or socioeconomic background information relevant to the OCS gas and oil program.

Methods A proposal process is initiated each year with a request for letters of intent to address one or more of the Framework Issues. The proposals are requested from university researchers and other scientific researchers in State agencies. A Technical Steering Committee made up of scientific representatives of the cooperators reviews letters of intent and proposals to be evaluated for possible funding. External peer reviews may be requested for new projects. Principal investigators give presentations at ITMís, scientific conferences, and various public meetings.

Importance to MMS By adopting this cooperative agreement, improved leasing decisions and EIS analyses pertinent to lease sales in the Beaufort Sea, Cook Inlet, Gulf of Alaska, and Chukchi Sea/Hope can be made. Final reports will be available for lease sales and post-sale decisions; interim data products and inputs will be used to address information needs. Topical areas to be addressed under the Coastal Marine Institute have been identified through this Annual Study Plan, previous Alaska Region study plans, and the Framework Issues. The study also will develop information that addresses public concerns raised during outreach efforts.

Date Information Required: Information products are required from 1 year to 6 months prior to proposed lease sales. Also, the information collected is required to be used in postlease decisions such as exploration plan reviews and approvals, and potential development-stage environmental impact analyses and related approvals, or in the implementation of lease-sale mitigating measures that require scientific information for implementation.

Submitted by: Alaska OCS Region

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Interagency Agreement

Title: Management, Logistics, and Warehouse Storage of Oceanographic Equipment

Actual Costs (in thousands):
FY2001 - $60
FY2002 - $60
FY2003 - $60
Total Cost: $180

Period of Performance: FY 2001-2003

Conducting Organization: GSA-administered lease for warehouse and MMS for Launch 1273 and other aspects

Description:

Background The MMS, Alaska OCS Region, has responsibility for equipment management in support of Alaska studies. In 1996 the General Services Administration (GSA) obtained a new storage facility for ESP use. The equipment is stored in a small warehouse in Anchorage, where it is maintained and made available for ongoing projects. This support element also provides funds for maintenance of the MMS Alaska Region Launch 1273, a small research vessel needed for various oceanographic studies, as well as funds for other equipment maintenance and shipping.

Objectives The purpose of this program-support element is to efficiently manage and store oceanographic equipment.

Methods The GSA arranges for an appropriate warehouse facility for our use.

Launch 1273 was commissioned in 1983. Since the boatís inception the vessel has had only episodic repairs on ìas needed items. The following items are in need of repair for the continuing and long term viability of the vessel:

1. Refurbishment and repair of the shipís steering/transmission systems. Each year these systems become less responsive and require more preparatory effort by the pilot to operate.
2. Non-functional fly deck instrumentation.
3. Removal of ìrelicî redesigns of the ship that have accommodated past research efforts but now merely complicate ongoing study efforts.
4. Redesign of the fuel tanks to facilitate refueling. Current design renders it very difficult to fuel the ship without spillage.

5. Overhaul of the internal electrical systems. The ship has changed power systems at least three times resulting in less than fully functional and reliable electrical systems. The ship console panel possesses numerous redundant switches, which should be eliminated.
6. General refurbishment of crew cabin. Cabinets, floor covering, sleeping bunks and general appointments are old, and fast deteriorating.

Also Launch 1273 needs to be transported to a shipyard in Southcentral Alaska.

Importance to MMS Without funding of this program-support element, it would not be possible to maintain or deploy the 36-foot MMS Launch 1273 that provides a mobile, cost-effective, and specialized research vessel for a variety of biological and oceanographic studies throughout the coastal waters of Alaska. Costs for certain studies would increase significantly if more expensive marine-support alternatives were chartered. Additionally, it would not be possible to maintain an equipment warehouse that allows us to re-use and share equipment effectively among projects and agencies. This is a critical program-support element related to studies that support all current leases. Funding for the next fiscal year is considered critical; the studies element cannot be deferred until the next budget period.

Current Status of Information: Not applicable.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: Contract

Title: Conference Management and Reports on MMS Results

Actual Cost (in thousands): $50-$600 **Period of Performance:** FY 2002-2006

Conducting Organization: MBC Applied Environmental Sciences

Description:
Background As discussed in Section 1 Introduction-Background of this Annual Studies Plan, the Alaska Environmental Studies Program (ESP) has organized many meetings on environmental studies information. During the past decade, the main priorities have been small workshops for resolution of environmental issues and Information Transfer Meetings (ITMís) for the exchange of studies information among Principal Investigators and the general public. In addition to the transfer of information through meetings, the ESP has transferred information through ITM proceedings, reports and publications on MMS results. The Alaska ESP has also organized small meetings on a limited range of topics called Information Update Meetings (IUMís). The Alaska ESP has also organized workshops with experts and interested parties on selected topics oriented to formulating a concepts for a new study to address a study need.

Objectives The objectives are to produce IUMís, small workshops, and publications on OCS environmental studies information.

Methods The primary method is to coordinate meetings and workshops and assist with preparation of publications. Coordination includes organizing appropriate speakers and participants and logistics.

1. Hold an interagency workshop on physical oceanographic process and research needs in the Beaufort Sea Planning Area. The workshop should review existing research, identify information needed, recommend experimental design and scope of field studies to address needs, and prepare a proceedings for public distribution.

2. Hold a workshop on protocol for assessing cumulative effects on the North Slope. The workshop should review existing research, identify information needed, recommend experimental design and scope of field studies to address needs, identify monitoring studies in particular, and prepare a proceedings for public distribution. The workshop should address climate change, air quality, long-distance transport of contaminants to the North Slope, contaminant sources, risks of contamination to subsistence foods, habitat loss, the

disturbance and displacement of terrestrial and marine mammal populations and subsistence hunters, and social and economic effects. The following types of entities should be invited to participate: Federal, state, and local agencies; tribal governments; Native organizations; industry; and universities. The need for a further follow-up workshop or workshops would be addressed.

3. Hold an IUM and/or a series of seminars in appropriate North Slope villages to transfer information on relevant ongoing and recently completed MMS studies. An IUM and/or seminars should be coordinated with appropriate North Slope entities including the North Slope Borough, Alaska Eskimo Whaling Commission, North Slope School District, and others. An IUM and/or seminars would consist of presentations on ongoing of recently completed MMS studies. The presentations would be in non-technical terms understandable by the layman. An IUM would be on 1 or 2 days probably in Barrow. The seminars could be held in villages, the highest priority being Nuiqsut, followed by Barrow and Kaktovik. The seminars could be held in high school level but open to the public and open to audience discussion. To maximize participation the seminars would be held in the winter when subsistence activities are at a minimum and at regular times. A series of 4-8 talks could be scheduled once a week for a series of weeks.

Importance to MMS This study will help to resolve environmental issues for MMS program managers and to increase public confidence in the data used by the OCS program.

Date Information Required: The need for the workshops on physical oceanographic processes and cumulative effects are needed for the proposed Beaufort Sea Lease Sales in 2005 and 2007, the proposed Chukchi/Hope Basin Lease Sale in 2007, and NEPA documentation for development and production plans. The need for the transfer of studies information is ongoing. The dates will be coordinated with lease sales.

Revised Date: June 2002

Section 2.2 Profiles of Studies Proposed for

FY 2003

Table 1: Alaska Region Ranking of Proposed Studies for FY 2003 NSL
June 2002

Page #	Title	Region Rank
	Physical Oceanography	
121	Sea Ice Modeling for Nearshore Beaufort and Chukchi Seas	Highest
123	Beaufort Sea Nearshore Currents	Highest
125	Mapping and Characterization of Recurring Spring Leads and Landfast Ice in the Beaufort Sea	Higher
127	Update Digital Interactive Climatic Atlases	High
	Fate and Effects	
129	Analytical Methods/Protocol to Effectively Test for Potential PAHís in Cetacean Tissues in the Event of an Oil Spill	High
	Biology	
131	Analysis of Variation in Abundance of Arctic Cisco in the Colville River	Highest
133	Locating Overwintering Fish Habitat, Colville River/Beaufort Sea	Highest
135	Development of Remote Sensing Survey Techniques for Marine Mammals and Birds in the Arctic	Higher
	Protected Species	
137	Protocol to Deflect Migrating Bowhead Whales Away from an Oil Spill	Higher
139	Distribution and Abundance of Harbor Seals	Higher
141	Monitoring Key Marine Mammals: Lower Cook Inlet	Higher
	Social Science and Economics	
143	Social and Economic Assessment of Major Oil Spill Litigation Settlement	High
145	Mitigation of Industry Operations on Drift Net Fishing	Higher
	Multidisciplinary	
147	Continuation of Arctic Nearshore Impact Monitoring in Development Area (cANIMIDA)	High
149	Update of Environmental Information for Cook Inlet, Chukchi/Hope Basin, and Norton Basin Planning Areas	Highest
151	Environmental Studies Data Management Support	High

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Interagency or Joint Funding

Title: Sea Ice Modeling for Nearshore Beaufort and Chukchi Seas

Period of Performance: FY 2003-2007

Description:
Background The MMS will use the results of the FY 2002 sea ice modeling workshop to focus on what MMS needs from this next generation, sea ice modeling effort. Thus objectives, method, and cost estimate will be revised per workshop results. MMS contributed to recent general ìiceî workshops in Alaska and Japan that have dealt with ice engineering and oil-spill response in ice rather than the specific problem of modeling fine scale ice/ocean and ice/ice interactions.

Most basin-scale dynamic-thermodynamic models in general use relatively simple thermodynamics and ice thickness distribution approximating the ice as slabs of a one to few meters mean thickness plus open water. While sufficient as a first approximation of the arctic ice pack, this treatment lacks the ability to sufficiently resolve the spectrum of ice thickness from thin new ice to thick ridged ice to fast ice that have been observed. In addition, the ice models in current state-of-the-art coupled ice/ocean models, including those current Rutgers and CMI models contracted by MMS, are based on empirical ice physics valid at a 100-km scale and extrapolated to smaller grid dimensions.

Development of new generation ice model has been proposed as a joint interagency funding project to MMS, Office of Naval Research, and National Atmospheric and Space Administration. For MMS purposes, this new generation ice model would need to improve modeling in two specific areas: spatial resolution and nearshore interactions. The resolution of ice models and ice data needs to be increased to address fine scale interactions necessary to model oil spill trajectories in the nearshore Beaufort and Chukchi Seas, including within and among barrier islands. Formation, extent, and persistence of landfast ice need to accurately portrayed.

Objectives The objective of this study is to improve the state of the art in ocean-ice or ice modeling and to produce either a stand alone ice/ocean model or an improved ice model that can be coupled to and or nested in the current MMS ice/ocean model. The existing or new model would be applied to the nearshore Beaufort and Chukchi Seas to predict the formation and melting of fast ice and the movement of broken ice fields, including within and among barrier islands.

Methods

1. Participate in interagency working group to co-fund new generation ice model

2. Develop new ice model based on smaller scale parameterization and inclusion of nearshore interactions (islands, landfast ice, etc.)

3. Produce stand-alone ice/ocean model or couple the ice model to the current MMS ocean model.

4. Run coupled model simulations.

5. Conduct sensitivity testing and validation of the model results.

Importance to MMS The importance to the MMS is to increase the accuracy of estimates of oil spill movement in ice in the Beaufort and Chukchi Seas. Current models are suspect inshore and at the 1 to few km resolution. This study will help resolve modeling issues for the Alaska OCS Region, increase confidence in the models used by the OCS Program, and help in review of oil-spill-contingency plans.

Date Information Required: This study will start the year after completion of the sea-ice modeling workshop, is long-term study to advance the state-of-the-art, and completion is not date critical. However, to show ongoing research in this area is necessarily to maintain faith with key Beaufort stakeholders. The information will also be used for NEPA documentation for proposed Beaufort Lease Sales and DPPís.

Revised Date: June 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Competitive or Interagency

Title: Beaufort Sea Nearshore Currents

Period of Performance: FY 2003-2006

Description:
Background Understanding the under-ice and open water currents through a long term time series is a necessary precursor to estimating potential effects on sensitive resources from oil spills or in the landfast ice. A current ongoing study will provide measurements from three locations within the barrier islands of Stefanson Sound near Northstar and Liberty for 1999-2000, 2000-2001, and 2001-2002. The ongoing study has provided the first current, temperature, and salinity data covering the entire freeze up, winter, and breakup periods in the nearshore Beaufort Sea. Preliminary evidence suggests that in the future, a single mooring would suffice in capturing the along-lagoon flow in this region of Stefanson Sound.

Other areas of the Beaufort Sea have different current regimes and have not been sampled for under-ice currents and only limited open water currents. Lagoons in the eastern Alaskan Beaufort Sea have narrower passes between the barrier islands, causing a pulsed circulation in and out of the lagoons. These passes are important due to their potential to funnel flow and oil spills into the lagoons. Camden Bay, also to the east, is not protected by barrier islands and represents a third type of coastal flow regime. The only current meter moorings for these eastern Beaufort Sea coastal regimes were a small oceanographic program in summer 1988 and 1989.

Objectives
1. Measure currents, temperature, and salinity hourly at three locations in the landfast ice zone; one in the vicinity of Liberty and Northstar and two in new locations with different flow characteristics.
2. Quantify the magnitude of current variability and to describe the relationship between currents and local winds.
3. Determine the vertical structure of the currents throughout the water column and how the structure changes with the development of the landfast ice through the winter and in summer when the ice melts and rivers flood the inner shelf.
4. Provide physical oceanographic data to the continuation of the Arctic Nearshore Impact Monitoring in Development Areas (ANIMIDA) study.

Methods

1. A 1200 kHz acoustic Doppler current profilers (ADCPs) will be moored for one-year periods, recovered, and redeployed for total of 3 years. All three moorings will have Conductivity Temperature Depth Measuring Devices (CTDís) and transmissometers.
2. Any mooring outside the barrier islands will require acoustic modem technology to allow periodic winter downloading of data from the mooring.
3. Local winds measured at Deadhorse, Northstar, Endicott, Oliktok and Badami and sea level data collected at the Waterflood facility will be collated for time-series comparison with mooring data.
4. Standard physical oceanographic time-series analyses (e.g., univariate statistical descriptors and correlation in both time and frequency domains) and velocity shear calculations will be done.

Importance to MMS This study will be useful to MMS to validate the oil spill risk analysis model. It will provide understanding for oil spill contingency planning in areas outside the barrier islands versus inside the barrier islands.

Date Information Required: This information will be used to evaluate oil spill contingency plans for Liberty, if approved, and other developments. It would also be used for NEPA documentation for proposed Beaufort Sea Lease Sales in 2005 and 2007.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive or Interagency

Title: Mapping and Characterization of Recurring Spring Leads and Landfast Ice in the Beaufort Sea

Period of Performance: FY 2003-2005

Description:

Background Spring leads in the Beaufort Sea occur every year to the east of Barrow. The size, frequency, and latitudinal extent of these leads, particularly further east from Barrow, are poorly known. In recent years, we have become aware that the Arctic Ocean, and especially the Beaufort Sea, responds to alternating climate states lasting a few to several years. A primary difference between the two alternating states is a weakening or reversal in the Beaufort gyre. Superimposed on, and interacting with the alternating climate states, is the estimated 40 percent thinning of Arctic ice pack over the last 30 years. The effects of climate state and ice thinning on spring lead characteristics in the Beaufort Sea are unknown.

Better information on how spring leads and moving ice pack interact is another issue, because this interaction is the key to how much risk spilled oil encapsulated in pack ice has to localized biota. Bowhead whales migrate past Barrow along these leads and westward, toward the Canadian Beaufort in the spring. The leads are also heavily used by spring migrating waterfowl. Risk from encapsulated oil would be less if the ice pack diverges along the lead lines as opposed to breaking up and crossing the leads.

The spatial location of landfast ice on a monthly basis is known in only a very generalized sense as shown in climatic or ice atlases. The new MMS sponsored sea ice atlas is being developed from the Joint Ice Center products, which are at a 25 km grid resolution and are too coarse for the detail needed. The spatial distribution of landfast ice was documented in the Beaufort Sea by Stringer in the mid 1970ís on a seasonal basis. The seaward limit of stable fast ice defines where under-ice pooling of spilled oil might take place and where fast ice conditions apply to design and operation of offshore facilities. It defines the location where no ice movement occurs. It is also the extreme landward boundary of possible whale migration routes during the springtime migration period.

Objectives

1. Document locations of recurring spring leads to the east of Barrow, and their extent across the Alaskan Beaufort Sea.

2. Document temporal and spatial occurrence of shoreward landfast ice line across the Alaskan Beaufort Sea to the Canadian McKenzie Delta.
3. Examine the effect of climate on lead and landfast ice characteristics.
4. Examine the effect of ice thinning on lead and landfast characteristics
5. Document dominant spring lead/ice pack interaction mode(s).
6. Map average monthly shoreward land fast ice line.

Methods

1. Review and synthesize literature and local information sources.
2. Synthesize and analyze current and historical remote-sensing imagery of recurring spring leads and shoreward landfast ice line.
3. Create geographic information system files summarizing the spatial distribution of spring leads in the Alaskan Beaufort Sea. Provide individual years as well as statistical representation of lead occurrence and distribution.
4. Create geographic information system files showing the monthly distribution of the shoreward landfast ice line across the Alaskan Beaufort Sea to the Canadian McKenzie Delta.
5. Provide individual months per year as well as statistical representation of landfast ice occurrence and distribution.
6. Provide relevant attributes to spatial data for use in a geographic information system.

Importance to MMS Because the predominant movement of a potential oil spill in the Beaufort OCS Planning Area would be from east to west, the potential interaction of oil and wildlife in spring lead system westward is a major concern. A better understanding of locations and characteristics of the spring leads would allow more accurate estimate of oil spill risk to the biota. New information on both the temporal and spatial aspects of landfast ice is the foundation for improving the oil spill risk analysis. Monthly winter landfast ice location would be a significant improvement over a seasonal winter location in use today. In addition this information is useful for validating ice models.

Date Information Required: This study meets an ongoing need for future sales, oil spill contingency planning, and for EISís or EAís for proposed Beaufort Sea Lease Sales in 2005 and 2007.

Revised date: June 2002

Region: Alaska

Planning Areas: Beaufort, Chukchi, and Bering Seas and Cook Inlet

Type: Joint Funding/Interagency

Title: Update Digital Interactive Climatic Atlases

Period of Performance: FY 2004-2006

Description:

Background This study will update and improve existing climatic atlases that will be a decade old. These atlases cover all planning areas in the Gulf of Alaska and the Bering, Chukchi, and Beaufort Seas. Improvements will be made in digital accessibility of data and consolidation of existing data. Although more than a fourfold number of marine data above 65°N. Latitude were available in 1987 than for the same area in the 1977 atlas, the data amount remained inadequate to permit a detailed analysis by meteorologists or by computer-contouring routines.

Historical climatic data exist at the National Climatic Data Center in two Comprehensive Ocean Atmosphere Data Set filesófile names TD-1170 (1854-1995) and TD 1129 (1980-1995). Both of these files have been updated to December 1995. The MMS has climatic data that have been summarized statistically by month in paper format updated to 1984. The budget for this study assumes 50 percent cost participation by other interested agencies.

Objectives

1. Acquire 1987 digital data presented in climatic atlases; (specifically sea surface temperature, wave height, precipitation, wind speed and direction, visibility, and air temperature).
2. Update climatic data to the present, collecting digital climatic data from the National Climatic Data Center, the U.S. Air Forceís Environmental Technical Applications Center, and other applicable sources.
3. Synthesize and format climatic data in a relational database similar to hardcopy climatic atlases for digital use in charts, graphs, maps, Geographical Information System (GIS) ArcView and Arc/Info software and word-processing applications.
4. Create the database on CD-ROM for use by other participating agencies, the public and MMS.

Methods This will be a three phase effort. The first phase first year will verify the availability of these digital data sets. Scientists would develop a coordination plan with other interested Federal agencies. If a significant portion of the data is not available in digital format, then the study will not proceed to the next level of effort unless additional funding is made available. The second phase of the study in the second year will collect previous digital data for the 1987 climatic atlas and update digital climate data to the present. Scientists will apply quality control to the data

using both computer and visual techniques to eliminate duplicate observations and questionable elements. Scientists will synthesize the data into monthly data elements previously established in the 1977 and 1987 climatic atlases. The last phase of the study will compile the data into a CD-ROM digital relational database and develop GIS and other graphical tools to analyze and display the data.

This study will provide usersí manual, and one- or half-day workshop to demonstrate database and provide user training.

Importance to MMS The primary MMS need is for an electronic rather than a paper atlas. Paper climatic data are no longer fully adequate to meet MMS needs. The data will be used for MMS oceanographic modeling efforts and to interpret the occurrence of biological data collected under the studies plan. MMS analysts use the current paper atlas data in describing the environment and setting the initial parameters for oil-spill-weathering models. MMS and others use the data for oil-spill-contingency planning. Because of expanding oil development in nearshore State and OCS waters, both MMS and the State of Alaska are particularly interested in a revised atlas with a comprehensive update of wind data for nearshore areas of the Beaufort and Chukchi Seas.

Date Information Required: There is continuous and increasing need for these data for EISís and post lease assessments for all active-planning areas.

Revised Date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin, Norton Sound

Type: Joint Funding/Interagency

Title: Analytical Methods/Protocol to Effectively Test for Potential PAHís in Cetacean Tissues in the Event of an Oil Spill

Period of Performance: FY 2003-2004

Description:

Background This study would review and synthesize information on available and developing state-ofñthe art analytical methods for determining PAH levels in cetacean tissues, and, if needed develop and refine enhanced analytical methods utilizing tissues from captive or common cetaceans. Cetacean tissues previously collected in Alaska, potentially suitable for PAH and PAH biomarker analysis, are cryogenically preserved as part of the MMS/USGS-BRD study Alaska Marine Mammal Tissue Archival Project. Based on the quantitative results demonstrating methodological reliability and accuracy, the study would draft a protocol to effectively collect and test for PAHís in Alaska cetacean species subsequent to oil spills related to offshore oil and gas development.

Interagency support for this project would be sought from other responsible authorities such as NOAA and/or EPA which may have post-spill damage assessment responsibilities under respective enabling legislation.

Objectives The overall goal of the study is to establish and/or enhance analytical methods/protocols to effectively test for potential oil-spill-related PAHís in cetacean tissues. Specific objectives for meeting this goal include:

1. Review literature to establish most reliable and effective alternative chemical/biochemical analytical methods for measuring PAH levels in cetacean tissues such as the integument, blubber, bile, gut, etc.
2. Identify advantages and disadvantages of alternative test methods in terms of potential confounding or uncontrolled variables, sources of error or reliability factors. Make recommendations regarding needed improvements in laboratory methodology, standards, processes, and analysis approaches.
3. Following interagency review, enhance specific laboratory and analytical methodologies as needed and decided appropriate.
4. Draft, coordinate interagency and public reviews, and finalize appropriate tissue collecting protocols considering Arctic and subarctic cetacean species, related natural and social environment, future expertise needed, and potential sources.
5. For all objectives, coordinate with ongoing work in other related MMS-sponsored or other related studies.

Methods The effective and reliable protocol for analyzing cetacean tissues may be adapted or improved from those already in use and identified in the literature review. At a minimum, analytical methods should be appropriate for enough specific sites on the whale carcass to obtain representative PAH and PAH biomarker levels for the whole animal. It should also include analysis of liver bile. Fresh and /or cryogenically stored cetacean tissues from captive or wild animals analyzed should demonstrate adequacy to establish mean values and ranges useful for determining whether whales exposed to an oil spill should be considered tainted for purposes of human consumption. The monitoring protocol should also be usable for documenting the persistence of PAHís and PAH biomarkers in whales harvested in years subsequent to a large oil spill.

Importance to MMS The study would permit MMS and/or other agencies to monitor levels of PAHís and PAH biomarkers in protected species that might contact spilled oil and to correlate potential contaminant loading with any sublethal effects noted in these species. The potential for tainting of subsistence-harvested cetaceans and other marine mammals from spilled oil is a frequently expressed concern of coastal residents. In the unlikely event of a large oil spill in the Alaska OCS, a variety of cetaceans could be exposed, thereby potentially affecting subsistence foods.

Date Information Required: The refined analytical methods and protocols would be used by Federal, local, and State authorities responsible for assessing and monitoring effects of oil spills subsequent to such events. These methods would also potentially update the Alaska Clean Seas Technical Manual relative to oil-spill preparedness at Northstar and other future exploration/development sites. These methods would also be used in future MMS-sponsored studies of cetaceans when needed to augment available information for cumulative effects assessments related to future proposed lease sales in the *Draft Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* (July 2001).

Revised date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive or Joint Funding

Title: Analysis of Variation in Abundance of Arctic Cisco in the Colville River

Period of Performance: FY 2003-2005

Description:

Background Native Alaskans are concerned that arctic cisco in the Colville River have been less abundant during the last few years than in the years preceding. Considerable research has been conducted on the natural history of the species, with particular emphasis being placed on the potential effect of causeways, constructed during oil development, on migration. The current understanding of the arctic cisco life cycle is that all spawning for the species takes place in the Mackenzie River drainages. The young-of-the-year leave the river during the spring and become entrained in wind-driven currents along the Beaufort coast. If east winds are sufficient and sustained, young fish migrate all the way to the Colville River, where they will spend several years maturing before returning to the MacKenzie River. If winds are not sufficient, they go elsewhere. Thus, migrations of arctic cisco are particularly vulnerable to large-scale changes in oceanic circulation, such as recent suspected changes in the Beaufort gyre, which may lead to modification of the strength and direction of nearshore winds. Nuiqsut villagers are also concerned that drilling muds, spilled underground during the construction of the Alpine pipeline, could be entering the river and have effects on the abundance of arctic cisco. Other factors that could affect arctic cisco populations include, but are not limited to, factors affecting recruitment at the MacKenzie River, changes in the channels of the Colville river and hence the distribution of fish available for subsistence use, fishing practices and harvest, and possibly, the cumulative effects of onshore and offshore oil-related development. A study is needed to further establish the observed trends in arctic cisco abundance and determine factors influencing population variation.

Objectives

1. Access information from Native subsistence users, fisheries biologists and governmental organizations to develop hypotheses on the variable, or possible declining, arctic cisco abundance in the Colville River and its tributaries.
2. Quantify inter-annual variation in the abundance of arctic cisco in the Colville River and its tributaries.
3. Use a statistical approach to estimate which environmental factors contribute to observed variation in arctic cisco abundance in the Colville River.

Methods

Phase I:

Sponsor a meeting of individuals with traditional and scientific knowledge about arctic cisco abundance and fishing success, stock exploitation, long-term climate related changes, and arctic cisco genetics to identify factors that might contribute to observed variation in arctic cisco abundance and to recommend a study design for further scientific inquiry.

Phase II:

1. Quantify the abundance of fish of various cohorts in the Colville and its tributaries using sampling techniques such as fyke nets.
2. Use existing data, and data from concurrent MMS- and MMS/CMI-funded studies to analyze the effects of changes in oceanic circulation on nearshore wind and related fish migrations between MacKenzie River and Colville River.
3. Review existing data from the MacKenzie River to see if gross changes in arctic cisco stocks have occurred.

During Phase I, the Alaska Region will attempt to seek joint funding from potential co-sponsors, such as the State of Alaska or other Federal agencies with fisheries management responsibilities.

Importance to MMS MMS will use the products of this study to address OCSLA requirements, assist NEPA-document preparation, prepare mitigating measures, review oil-spill-contingency plans, facilitate outreach with North Slope communities regarding the MMS program, and review and formulate offshore policy for Alaska.

Date Information Required: The study will provide information for NEPA documentation for proposed Beaufort Sea Lease Sales in 2005 and 2007 and possible DPPs. Interim reports will be available to MMS following each field season.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea

Type: Interagency or Competitive

Title: Locating Overwintering Fish Habitat, Colville River/Beaufort Sea

Period of Performance: FY 2003-2005

Description:

Background Very little documentation exists on actual overwintering habitat of Beaufort Sea amphidromous fish. Amphidromous fish such as char, cisco, whitefish and grayling depend almost exclusively on Beaufort Sea coastal waters for food. After a brief summer in food-rich coastal marine waters, the fish are believed to retreat to overwintering sites as Beaufort waters turn frigid and inhospitable in fall. Brackish deltas, deep pools, springs, and freshwater lakes are considered the primary overwintering habitats. Whether amphidromous fish overwinter in nearshore areas just outside the shorefast ice is unknown (Holland, pers. comm).

Overwintering sites are especially critical to some species because they must occupy these limited sites for two-thirds of the year. Just when inland waters become essential for overwintering they shrink by 98% due to reduced runoff and freezing. By late winter, even the largest rivers cease to flow and freeze to the bottom over long stretches. If the fish are forced to crowd into limited deepwater pockets, the waters could become overcrowded, anoxic, and may freeze. Once the connecting channels freeze solid, the fish would be isolated and unable into more hospitable habitat. Thus, in order to return to coastal environments for the short 2-3 month summer growth spurt, amphidromous fish must survive a minimum of eight months in these pockets, from fall freeze-up to spring breakup. If overwintering also occurs beyond the shorefast ice, then overwintering habitat may not be limiting.

Recently, remote sensing applications such as synthetic aperture radar (SAR) in conjunction with modeling have reduced the potential high cost of evaluating overwintering habitats. Developing methods using these techniques would increase our efficiency in identifying overwintering. A greater knowledge of overwintering sites is critical to protecting critical subsistence and biological resources while developing offshore oil and gas resources.

Objectives

1. Identify probable amphidromous overwintering habitats of the Beaufort Sea.
2. Test remote sensing applications for documenting overwintering habitat.
3. Document presence or absence of overwintering fish inland and beyond shore fast ice.

Methods

1. Identify suspected nearshore amphidromous overwintering sites in test and control areas from local knowledge, literature, and remote sensing data. Choose a river system believed to support extensive overwintering and another river system believed to support little overwintering as a control.

2. Use available remote sensing data such as SAR and SAT images, or existing data to estimate location and of amount amphidromous overwintering habitat.

3. Document actual use by remote under-ice photography, diving and/or sampling from onshore pipeline region to beyond shore fast.

4. Evaluate remote sensing tools to identify amphidromous overwintering and estimate cost of documentation across the Beaufort Sea.

Importance to MMS MMS is responsible for identifying and mitigating potential environmental effects of OCS development to biological and subsistence amphidromous fish resources. Amphidromous fish in limited inshore overwintering sites are particularly vulnerable to disturbance or reduction of habitat by human activities and developments onshore including pipelines, roads, water withdrawals for ice roads, and oil leaks and spills. Amphidromous fish overwintering beyond the shorefast ice would be more susceptible to off shore development activities such as ice roads, causeways, drilling and under ice oil spills. Presently, limited knowledge of actual overwintering sites hinders evaluation of these potential effects. Documenting overwintering sites is prohibitively expensive using present techniques. Information from this study will contribute to Beaufort Sea EIS's, EA's and mitigation measures in 2005, 2007.

Date Information Required: FY 2004 for the Beaufort EIS or EA in 2005.

Revised date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin, and Norton Basin

Type: Interagency or Competitive

Title: Development of Remote Sensing Survey Techniques for Marine Mammals and Birds in the Arctic

Period of Performance: FY 2003-2005

Description:
Background Conducting assessments or tracking trends of Arctic marine-wildlife populations is extremely difficult, logistically complex, and expensive. Past efforts have generally produced unsatisfactory population estimates due to high variance associated with the estimates. This primarily results from the inability to design a survey that can sample large geographic areas rapidly with a high degree of accuracy. Aerial surveys for pacific walrus, ringed seals and a variety of sea ducks undertaken from the 1960ís to the 1990ís exemplify this problem.

The application of remote sensing techniques to study of marine animals is in its infancy. Vertical aerial photography with medium and large format precision mapping cameras has received the most attention to date. Descriptions and applications for infrared and ultraviolet films and sensors have been explored with some successful results. Techniques for counting groups of animals and characterizing habitats they occupy with visual aerial surveys is generally crude, and the results tend to include considerable observer bias. Inconsistency within and between surveys is often high, making trend analysis impossible. High-resolution commercial imaging satellites have recently become available and may offer sub-meter resolution by early 2002 that could replace visual surveys for some marine species. It is reasonable to assume that this technology will continue to rapidly improve as high consumer and governmental interest exists for these products on a worldwide basis. Existing airborne infrared technology operating in thermal wavelengths also has some potential for detecting and enumerating pinnipeds hauled out on sea ice. Remote sensing based surveys potentially provides a permanent data record that can be carefully analyzed in the office, free of observer based biases, and that will be useful for analyses of habitat correlates, group behavior, and reproduction. Additionally, all data from remote sensing survey efforts, and the basis for the analysis and conclusions from the data obtained would potentially be accessible to future workers.

The U. S. Fish and Wildlife Service recently successfully obtained satellite images of Pacific walrus hauled out on numerous beaches on Round Island (Bristol Bay, Alaska), made initial collections of walrus on land and sea ice haulouts with an across-track thermal scanner, and collected images (from 2,000 to 12,000 feet above sea level) of walrus on sea ice. All of these

initial trials have produced useful data, and have demonstrated promising applications to survey problems.

Objectives
1. To explore and develop techniques for using space-based remote sensing system to detect and enumerate marine mammals and birds in Arctic habitats.
2. To test the capabilities of airborne thermal systems and digital and film photography from high altitudes.
3. To detect and enumerate pinnipeds hauled out on land and sea ice and study the application of these technologies to future surveys.

Methods The following activities are in priority order and can be undertaken all in one year or in phases over the life of the project. Each activity can be pursued independent of the other, and results can be pooled later to produce a comprehensive report. All of the following methods to detect and enumerate marine mammals or birds with remote sensing systems and characterize the habitats they occupy will be analyzed with raster based software products. Ground truthing will be achieved with land and ship based counts, and density correction factors developed by using conventional aerial photography techniques.
1. Obtain commercial satellite images of pinnipeds hauled out on sea ice and land, and as possible other marine mammals or birds in marine waters, of the Chukchi and Bering Seas, and Bering Straits
2. Test airborne thermal imagery systems to determine their capabilities to detect and enumerate pinnipeds hauled out on sea ice both during the day and at night, and as possible other marine mammals or birds in marine waters, and determine the maximum altitude possible for collection of images with useful resolution of surveys.
3. Use digital and film based aerial photography from a variety of altitudes, analyzed with visual as well as computer based techniques, to determine the optimum resolution and maximum scale and altitude useful for surveys of various species.

Importance to MMS Marine mammals and birds are significant members of Arctic marine ecosystems, and important to the subsistence culture of Native Arctic peoples. Effective management of all species in the Chukchi Sea and throughout the Pacific Arctic is impaired by the lack of current population information. Even if funding for surveys were available, existing techniques would not always produce population estimates with the confidence levels necessary to meet current management needs and the analysis of trends that will be desirable in the future.

Date Information Required: Information is needed after 2003 to support NEPA documentation for: exploration and possible development of the McCovey prospect; monitoring at Northstar; Beaufort Sea lease sales in 2005 and 2007; a Chukchi/Hope Basin Sale in 2007; and will develop potentially useful methodology for studies to support Cook Inlet lease sales in 2004 and 2006

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive or Interagency

Title: Protocol to Deflect Migrating Bowhead Whales Away from an Oil Spill

Period of Performance: FY 2003

Description:

Background As a member of the North Slope Spill Response Project Team, MMS relies on the Alaska Clean Seas (ACS) Technical Manual for guidance in the unlikely event of a large oil spill in the Beaufort Sea. In addition, oil companies submit an Oil Prevention and Technical Plan (OPTP) to MMS for Federal approval. While these plans consider deflection of polar bears and waterfowl, neither the ACS Technical Manual nor the OPTP deal specifically with bowhead whales, an endangered species and a most important species to North Slope subsistence villages. The study would test methods and develop a step-down protocol for on-scene managers to rapidly mitigate the effects of a large oil spill on bowhead whales.

Objectives The overall goal of the study is to develop guidelines for keeping bowhead whales away from large oil spills. Specific objectives for meeting this goal include:

1. Analyze the literature on potential methods (e.g., noise) for herding or deflecting cetaceans away from oil spills or other effects.
2. Develop a workable field protocol for using tested methods to keep bowhead whales away from a large oil spill.
3. If necessary and feasible, conduct selected field tests to determine the most effective ways to deflect captive cetaceans and/or bowhead whales away from a proscribed area.

Methods Analysis of the literature will consider the potential for use of acoustic disturbance (e.g., seismic arrays, icebreaker cavitation, whale boats, orca noise), visual disturbance (e.g., low-flying aircraft), and physical barriers (e.g., oil booms, stationary nets. The protocol will have a rapid-deployment quality in the unlikely event of a large oil spill. The cost of implementing the protocol should be considered, but should not limit important workable options. The purpose of the protocol is to exclude or deflect migrating whales away from the perimeter of a large oil spill without scattering whales in adverse directions. Variables to consider that might limit the effectiveness of certain options include ambient ice type and ice concentration, competing disturbances from oil-spill cleanup activities, and uncontrolled vessel and air traffic.

Appropriate permits should be obtained for field testing, if necessary. Any field testing involving bowhead whales will be carefully coordinated with the National Marine Fisheries Service and the

Alaska Eskimo Whaling Commission in advance to avoid or minimize the potential for disturbance to the subsistence harvest.

Importance to MMS It is important to update and augment the ACS Technical Manual relative to bowhead whales. A protocol for keeping bowheads away would likely become a key part of any first-line response in the unlikely event of a large oil spill in the Beaufort Sea. The worst case would be a well-head blowout at Northstar and/or Liberty production facilities. The protocol would help reduce the potential for any oil-spill-related mortality or sublethal effects (e.g., feeding and reproduction) to this endangered species. While implementing the protocol might add to the expected disruption of the whale harvest in the year of any large oil spill, it would reduce the likelihood and scope of potential damage relative to perceived tainting of muktuk and other tissues. In their 2001 Arctic Region Biological Opinion, National Marine Fisheries Service makes a Conservation Recommendation that MMS study ìthe possible use of airguns as a deterrent for bowhead whales near an oil spill.î

Date Information Required: The protocol would be used immediately to update the ACS Technical Manual relative to oil-spill preparedness at Northstar. The information is also needed for oil-spill preparedness at Liberty, which, if approved, is anticipated to begin producing oil in 2004.

Revised date: June 2002

Region: Alaska

Planning Areas: Cook Inlet

Type: Interagency or Competitive

Title: Distribution and Abundance of Harbor Seals

Period of Performance: FY 2003

Description:
Background Harbor seals have been identified as a ìkeystoneî species in the Cook Inlet and Gulf of Alaska marine environment. They represent a top-level predator in the food chain and an abundant species that occurs on the OCS year-around. The western Gulf of Alaska/Cook Inlet population of harbor seals has declined drastically since 1976 (Pitcher 1990). Any perturbations that might be associated with Cook Inlet oil and gas activities could threaten this depleted population. Information on the current trend in the population is needed to adequately assess potential effects of oil and gas activities on this population. Their distribution could be affected by operations, and their abundance probably could be affected by a substantial oil spill. National Marine Fisheries Service, with support from the MMS, would determine the distribution and abundance of harbor seals in Cook Inlet/Shelikof Strait.

Objectives To provide a sound, scientific protocol for aerial surveys to evaluate harbor seals in the Cook Inlet/Shelikof Strait Area.

Methods
1. Review and refine the previously established protocol for harbor seals by aerial surveys including information gleaned from EVOS Prince William Sound harbor seal surveys.
2. Estimate relative abundance and density of hauled out harbor seals along the coast of the Alaskan Peninsula, Kodiak/Afognak Islands of Shelikof Strait.
3. Correlate harbor seal densities along the coast with environmental parameters.

Importance to MMS This study will provide a sound, scientific protocol for aerial surveys to evaluate harbor seals in the Cook Inlet/Shelikof Strait area. Updated information on important biological populations in proposed oil- and gas-lease-sale areas is used for EISís and post-lease assessments. Population estimates derived during this study will facilitate post-sale mitigation. The study will also provide information that addresses public concerns raised during outreach efforts. Like the Steller sea lion, which has been placed on the Endangered Species List, the western Gulf of Alaska/Cook Inlet population of harbor seals have drastically decline in the past 20 years. Any perturbations that might be associated with Cook Inlet oil and gas activities could threaten this depleted population. Information on the current trend in the population is needed to adequately assess potential effects of oil and gas activities on this population.

Date Information Required: This study will provide information for NEPA documentation for proposed Cook Inlet Lease Sales in 2004 and 2006.

Revised date: June 2002

Region: Alaska

Planning Areas: Cook Inlet

Type: Competitive or Joint Funding

Title: Monitoring Key Marine Mammals: Lower Cook Inlet

Period of Performance: FY 2003-2007

Description:
Background A number of species of marine mammals regularly utilize near-shore habitat in lower Cook Inlet, including: Stellerís sea lions, harbor seals, sea otters, harbor porpoise, Dahlís porpoise, and minke whales. In addition to the endangered Stellerís sea lion, harbor seals and sea otters may have regionally declining populations and are potential candidates for listing under the Endangered Species Act in at least some of their range in southern Alaska.

Significant concentrations of harbor seals and sea otters have been identified in Kamishak Bay in southwestern Cook Inlet. Kamishak Bay is also likely to be vulnerable to pollution in the event of an oil spill, as was evidenced when oil spilled by the *Exxon Valdez* was deposited as tar balls and mousse on the beaches of western Cook Inlet, including Kamishak Bay. Thus, local concentrations of some marine mammals in Kamishak Bay may be vulnerable if oil is developed in nearby OCS waters of Cook Inlet.

Kamishak Bay is relatively isolated and has been little studied with respect to the population status of local marine mammals. This study is designed to provide pre-development baseline data on the status of key marine mammals using the waters in, and near, Kamishak Bay.

Objectives Obtain pre-development baseline data on the status of key marine mammals using the waters in, and near, Kamishak Bay,

Methods Develop and execute protocols for:

1. Aerial and/or boat surveys of abundance of key marine mammals in Kamishak Bay.

2. Surveys of productivity of key marine mammal populations in Kamishak Bay.

3. Monitoring the body condition and/or measuring body growth of key marine mammals in Kamishak Bay for about 5 years to provide suitable data and confidence intervals for comparison with post-development studies

Importance to MMS Data on abundance and population status of key species will be used for comparisons with similar data collected following oil and gas development. Analysis will increase understanding of the effects of such development on populations of key marine mammals. New data will also be available for use in EIS development.

Date Information Required: Preliminary information is needed NEPA documentation for proposed Cook Inlet Lease Sales in 2004 and 2006.

Revised date: June 2002

Region: Alaska

Planning Areas: All

Type: Competitive

Title: Social and Economic Assessment of Major Oil Spill Litigation Settlement

Period of Performance: FY 2003-2005*
(*see Method 4)

Description:

Background Major oil spills such as the 1978 Amoco Cadiz and 1989 *Exxon Valdez* (EVOS) events led to a variety of documented social and economic effects. But spill-related litigation and settlement processes and their effects have not been a common topic of socioeconomic research. Regarding EVOS, social scientists speculate that final settlement and distribution of award monies will lead to various beneficial and detrimental secondary effects in addition to those related to the original spill and cleanup events and subsequent phases of litigation. The nature and intensity of such effects hypothetically relate to socioeconomic, demographic, and other attributes of recipients, and to the nature of experience with the spill and litigation.

A recently completed MMS study ìExxon Valdez Oil Spill, Cleanup, and Litigation: A collection of social impacts information and analysisî (MMS OCS Study 2001-085) provides a comprehensive qualitative overview of general information which will provide useful background to the present quantitative effort.

Objectives Analyses of data collected in spill-affected communities soon after the EVOS event report that existing social problems were heightened in relation to the influx of spill clean-up monies and resources, particularly in rural-Native communities where access to subsistence resources was limited. Subsequent analyses suggest that larger communities have benefited from opportunities such as eco-tourism that were not extant before the spill. It may be hypothesized that spill clean-up and restoration monies and resources served to amplify social, demographic, and economic trends and attributes of the awardees in all cases at individual, familial, and community levels of analysis. The objective of this study is to test this hypothesis given potential future influx of monies and resources via final litigation settlement.

Methods The study will require compilation and quantitative analysis of existing data, collection of new pertinent information, coordination with similar research conducted in the region, detailed comparative analysis, and development of summary recommendations. The methods are:

1. Compile existing data regarding pre- and post-EVOS social and economic conditions and trends from a northern Kodiak village community, and from City of Kodiak. Pursue the

following key indicators at the individual, family, and community levels of analysis: standard demographic attributes, socioeconomic status, migration patterns, social relations, patterns of investment and return, commercial fishing investment and return, traditional subsistence activities, and selected social practices.

2. For statistical/analytical control purposes, identify a village and town similar in size and socio-demographic attributes to those in (1) above that were not affected by the spill. Collect parallel data in those communities.
3. Analyze the data compiled in (1) above to develop a descriptive comparative analysis of the effects of the spill per said categories of variables for the two affected communities and the two unaffected communities.
4. Gather data for the same data categories from all four communities prior to final spill litigation settlement (Phase One) and immediately subsequent to disbursement of monies and resources (Phase Two). Because the date of the court decision is unknown, the beginning of Phase Two and completion of the study will be flexible and keyed to the timing of the court decision.
5. Using both qualitative and quantitative analyses, generate a descriptive-comparative assessment of EVOS effects per said variables at each level of analysis, and through all phases of spill, clean-up, and litigation for the Kodiak communities and with comparative analytical attention to the control communities.
6. Select a panel of persons/families in each affected community who experienced the various phases of the EVOS event and use the analysis generated in (5) above as comprehensive descriptive context for describing the course of spill and post-spill life events for those persons and families. Develop limited comparison with persons/families in control communities.
7. Use the analyses in (5) and (6) above to generate an analytical summary of EVOS social and economic effects that is responsive to the original hypothesis stated above.
8. Report findings and general recommendations relevant to effective management of potential future major oil spills and related litigation and settlement.

Importance to MMS The potential social costs of major coastal oil spills are a public concern associated with OCS development in the U.S. Insofar as the effects of EVOS continue to frame community response to oil and gas development, comprehensive understanding of the event and its various effects are of importance to MMS Alaska OCS Region. This study will generate analysis of utility for EA and EIS documentation, and an empirically-based framework for predicting and managing social effects potentially resulting from major oil spills and resulting oil spill litigation.

Date Information Required: This information is needed for NEPA documentation for proposed Beaufort Sea Lease Sales in 2005 and 2007, Cook Inlet Lease Sale in 2006, and Chukchi/Hope Basin Lease Sale in 2007, and review of exploration, development and production plans.

Revised Date: June 2002

Region: Alaska

Planning Areas: Cook Inlet/Shelikof Strait

Type: In-house or Competitive

Title: Mitigation of Industry Operations on Drift Net Fishing

Period of Performance: FY 2003-04

Description:
Background Drift net fishermen have expressed a concern about their nets getting caught on oil rigs or the loss of harvest resulting premature release when the drift is toward a permanent facility. A previous study partially addressed this issue: "Mapping Cook Inlet Rip Tides Using Local Knowledge and Remote Sensing" (OCS Study MMS 2000-025). That study mapped rip tides, provided statistics on consistency of rip tide locations, and provided an information base on fishermen's use of rip tides. According to MMS 2000-025 "avoiding fixed objects while drifting with a long net up to 270-m long is difficult given the distance a boat may float while hauling up a net. For example, fishermen reported taking 15 minutes to pull in an empty net, if nothing goes wrong. During this time, a boat and gear might travel 1 nm, given a conservative current of 4 knots. Consequently, avoiding stationary objects in Cook Inlet is difficult during an active fishing operation."

Given the dynamic interaction of fishing regulations, weather, tides, and fishing technology, specific methods to mitigate concerns and/or future conflicts remain and could pose potential delay to MMS leasing goals.

Objectives
Identify methods to mitigate potential for drift nets entangling on oil rigs in Cook Inlet or the loss of harvest resulting in premature release when the drift is toward a permanent facility.

Methods
1. Synthesize information from OCS Study MMS 2000-025 and other sources.
2. Do literature search to find mitigation of such conflict in other places in the world.
3. Consult with fishermen and oil and gas industry personnel to define mitigation methods.
4. Analyze economic tradeoffs of alternative potential mitigation measures.
5. Analyze structure of changes of the commercial fishing industry and account for these with respect to potential mitigation measures.
6. Examine whether existing service bases would be used or addition infrastructure would be built. If alternative sites need to be developed, examine the potential of creating social impacts.

Importance to MMS MMS is responsible for identifying and mitigating potential environmental effects of OCS development to fish resources. Formulating effective mitigation measures will help resolve an important stakeholder concern. Mitigation measures from this study should mitigate potential effects from of OCS activity in Cook Inlet. They will contribute to NEPA documentation for potential exploration, development and production associated with the proposed Cook Inlet Lease Sales in 2004 and 2006 and existing leases from Sale 149.

Date Information Required: FY 2004

Revised date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive or Contract Modification

Title: Continuation of Arctic Nearshore Impact Monitoring in Development Area (cANIMIDA)

Period of Performance: FY 2003-2008

Description:

Background The Arctic Nearshore Impact Monitoring in Development Area (ANIMIDA), a five-year study started in 1999, has provided baseline data and monitoring results for chemical contamination, turbidity, and subsistence whaling in the vicinity of Northstar and Liberty development sites. Northstar is in State waters, but includes production of some OCS oil through directional drilling. Liberty, if approved, will be the first offshore OCS development project in the Beaufort Sea or elsewhere in the Alaska OCS. ANIMIDA monitoring for Northstar includes pre-construction, and construction, and early production periods. The last field sampling for ANIMIDA is scheduled for spring 2003. This proposed study would begin thereafter, with an initial planning phase funded and procured under FY 03 appropriations.

Objectives This study will gather long term monitoring data which will provide a basis of continuity and consistency in evaluation of potential effects from site-specific, recently initiated development and upcoming production in the Beaufort Sea OCS. Currently, these site-specific areas include the Northstar and Liberty areas, other prospects would be included if proposed for development. Priority monitoring issues will be determined through public and interagency comment, and coordinated with lessees and other organizations. At minimum, we expect cANIMIDA to continue the following ANIMIDA objectives:

1. Hydrocarbon and metal characterization of sediments, bivalves and amphipods in the study area.
2. Annual assessment of subsistence whaling near Cross Island.
3. Sources, concentrations, and dispersion pathways for suspended sediment.
4. Monitoring the Boulder Patch.
5. Characterization of anthropogenic contaminants in upper tropic biota.

Methods Field logistics for both phases include helicopter support and small vessel (e.g. MMS Launch 1273) support in the ìopenî water season and snow machine/ rolligon support in winter/spring. Samples will be collected from construction gravel pits, artificial islands, rivers, barrier islands, and sediment from ANIMIDA offshore stations and along the Liberty pipeline route. Turbidity, total suspended sediment, current velocity measurements are being made in the vicinity of construction, spoils dumps and other sites including local rivers and the Boulder

Patch. Sediment and suspended sediment samples will be analyzed for PAH, trace metals, and supporting chemistry using methods consistent with prior ANIMIDA analyses. Biota sampling (species and contaminants measured) will be based on results and recommendations from ANIMDIA. Kelp productivity will be monitored in the Boulder Patch and will use the inherent optical properties of the ice and water to determine the effect of sediment resuspension on kelp productivity. Optical-related measurements will include spectral irradiance, light scattering coefficients, and total suspended solids. The reporting program for Cross Island whaling, which records information on whaling locations, success, and whaler perceptions, will be supported. Field programs will be scheduled in 2003-2006, Year 5 (FY2007) will be devoted to reporting of monitoring results.

Importance to MMS Northstar construction started during the ANIMIDA study. Liberty, if approved, could start construction in 2003, with the EIS currently being finalized by the Alaska OCS Region. Development of these Units is generating public concerns regarding effects on nearshore biota and environment. Interagency reviews of related EISís and Development and Production Plans recommend monitoring effects of Northstar and Liberty.

Date Information Required: There is a continuing, ongoing need for this monitoring information during the performance period of the study, which will coincide with early production from Northstar and Liberty construction, if approved.

Revised date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Chukchi Sea, Hope Basin, Norton Sound, Cook Inlet

Type: Competitive

Title: Update of Environmental Information for Cook Inlet, Chukchi/Hope Basin and Norton Basin Planning Areas

Period of Performance: FY 2003

Description:

Background In the *Final Proposed Outer Continental Shelf Oil and Gas Leasing Program 2002-2007,* (July 2002), the MMS proposes lease sales in Cook Inlet, Chukchi/Hope Basin and the Norton Basin Planning Area. Since it has been several years, or longer, since EISís were written to describe potential developments in those areas, MMS literature reviews are now somewhat out of date. Updated literature surveys would potentially benefit MMS analysts, representatives of other agencies and organizations and the general public in efforts to evaluate the effects of proposals to develop OCS oil and gas in the above planning areas.

Objectives Make available new scientific information on the biology and status of important vertebrate species for easy access by MMS analysts, representatives of other agencies and organizations and the general public.

Methods Conduct a literature survey and prepare an annotated bibliography of new scientific information (past 5-10 years, depending on area) on fish, marine mammals, marine birds, ecosystems, and human social systems that might be affected by oil and gas development in the OCS. Potential sources of information include, but are not limited to:

1. Primary scientific literature and books.
2. Unpublished reports, analyses, and other accessible documents.
3. Other sources such as internet homepages and accessible data bases.

These objectives will be accomplished in coordination with other ongoing studies, as appropriate, to avoid duplication.

Importance to MMS Annotated bibliographies will be useful to MMS analysts for purposes of evaluating the effects of OCS oil and gas developments. They will also help inform individuals from other organizations and the general public about the current status of the Alaska OCS human, marine, and coastal environment, and thereby facilitate the EIS review process.

Date Information Required: Bibliographies are needed for EISís for proposed Cook Inlet Lease Sales in 2004 and 2006, Chukchi/Hope Basin Lease Sales in 2004 and 2007, and Norton Planning Area Lease Sales between 2003 and 2007 depending our nominations received.

Revised date: June 2002

Region: Alaska

Planning Areas: All Alaska Planning Areas

Type: In-house or Competitive

Title: Environmental Studies Data Management Support

Period of Performance: FY 2003-2005

Description:

Background The Environmental Studies Section of the Alaska OCS Region needs appropriate environmental studies data management support in the review of Alaska studies contract data deliverables. Many of the Alaska studies contracts contain requirements of the MMS Coastal Offshore Resource Information System (CORIS). CORIS requirements are often for GIS data deliverables and database design information that are beyond the technical scope of Contracting Officerís Technical Representatives (COTRís). These database deliverable requirements can be very complicated in part because of the complexity of and changes to CORIS standards set forth by the MMS Information Technology Division. Most COTRís do not have the expertise to adequately review the interim or final data deliverables because of the complexity of the software requirements and the database design documentation. In addition, much of the databases have not been integrated and made useable for environmental assessment because of the added complexity of integrating new information with historical data.

Objectives The objective is to provide environmental studies data management support to the Alaska Environmental Studies Program (ESP).

Methods This project will provide assistance to COTRís in:

1. Reviewing and interpreting interim and final environmental studies data products.
2. Incorporation of the environmental studies data into MMS databases including those in CORIS.
3. Compilation of historical data sets collected by the ESP.
4. Distribution of the data to the public and to Federal, state, or private entities.

Importance to MMS This project will provide support to COTRís so that ESP data can be reviewed for quality control relative to CORIS standards and can be integrated into EISís, EAís, DPPís, and MMS planning documents.

Date Information Required: We have an immediate need for ongoing technical assistance with Environmental Studies data. This project will provide immediate assistance to COTRís in the assimilation and distribution of environmental studies data.

Revised date: June 2002

Section 2.3: Profiles of Studies Proposed for

FY 2004

Table 2: Alaska Region Proposed Studies for FY 2004

June 2002

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195	GIS Internet Map Server (ARCIMS) Web Site for the MMS Sub-sea Physical Environmental Database (SPED)
197	Cumulative Effect of Offshore and Onshore Oil and Gas Development on the Beaufort Sea Environment

Region: Alaska

Planning Areas: Beaufort Sea, Cook Inlet

Type: Competitive or Joint Funding

Title: Surface Circulation Radar Mapping in Alaskan Coastal Waters: Field Study Beaufort Sea and Cook Inlet

Period of Performance: FY 2004-2006

Description:
Background Over the past 25 years, oceanographic radar techniques have been developed and improved so that detailed, gridded, 2-dimensional maps of surface circulation can be provided and recorded in real time. Currents would play a critical role in the transport and fate of spilled oil, but there is paucity of direct circulation measurements in some areas of the Beaufort Sea and Cook Inlet. Current meters provide only data at specific points and not at the water surface, where they oil would be. These radar techniques provide a measured equivalent of a gridded circulation model and can be used as input to and validation for oil spill trajectory models.

Several entities, including MMS, NOAA, the Prince William Sound Oil Spill Recovery Institute, the University of Alaska Fairbanks, and oil industry have expressed interest in using circulation mapping radar techniques in Alaskan coastal waters, but no user-group or specific program has been developed for radar use. The radar units are expensive and cost and use-sharing rental agreements among multiple users is a preferred approach. This study presumes the development of a users group to cost and use sharing of rented radar units under a prior Feasibility Study.

Objectives This studyís objectives would be to implement the Beaufort Sea and Cook Inlet radar mapping strategies. This study would require an additional funding commitment from MMS and may be dependent on cost sharing among the radar users group.

Methods
1. Implement a radar mapping strategy for Beaufort Sea.
2. Implement a radar mapping strategy for Cook Inlet.

Importance to MMS The Oil-Spill-Risk Analysis (OSRA) is a cornerstone to regional EISís environmental assessments, and oil-spill-contingency planning. MMS is being tasked with providing circulation and oil-spill-trajectory information at higher resolution than feasible or justifiable by current modeling state-of-the-art or current-meter technology. Oil-spill issues constitute a significant portion of public comments submitted on sale or development EISís in the Alaska OCS Region.

Date Information Required: Information from this study will be used by Alaska OCS Region staff in preparing future development EISís, lease sale EISís under the *Final Proposed Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* (July 2002), and in reviewing oil-spill-contingency plans.

Revised Date: June 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Competitive or Interagency

Title: Mapping Sea Ice Overflood Using Remote Sensing from Smith Bay to Camden Bay

Period of Performance: FY 2004-2005

Description:

Background MMS has limited spatial and temporal information on rivers overflooding the nearshore sea ice in spring. The most recent work, Dickins (1999) focuses on overflood of the Sagavairiktok River in the vicinity of Liberty, a very small portion of the entire area MMS regulates. There is also three years of overflood data for the Kuparuk River in the vicinity of Northstar. Landsat Imagery has been collected by Stringer (1988, 1993) and archived at the University of Alaska Geophysical Institute for the Beaufort Sea. With the advent of development in the Beaufort Sea this type of information is needed to address issues regarding pipeline routing and facility siting. This study would provide baseline data and improve the accuracy of information for environmental assessment and hazard mitigation. These observations would also be of value to the offshore industry for operations on the OCS.

Objectives The objectives of this project are to produce a time series depicting the spatial distribution of river water overflooding the landfast ice adjacent to the Beaufort sea coast where exploration and development may occur. A second objective is to quantify the relationship between stream flow and ice damming for the Sagavanirktok and Kuparuk rivers, and the aerial extent of overflooding on the landfast ice adjacent to those rivers

Methods

1. Collect and synthesize existing Landsat/Radarsat remote sensing data.
2. Quantify the spatial and temporal distribution of river overflood of the moderate size rivers on the North Slope of Alaska from Smith Bay to Camden Bay. Focus on mapping the maximum overflood extent.
3. Fly an aerial survey for one season to ground truth remote sensing data and quantify uncertainties of estimating the overflood from remotely sensed data.
4. Collect new hydrographic data for the Sagavanirktok and Kuparuk rivers and quantify any relationship between river runoff and aerial extent of overflood.
5. Create a geographic information system map summarizing the spatial distribution of river overflood by year along the Beaufort Sea Coast. Provide individual years as well as maximum historical overflood extent.
6. Provide relevant attributes to spatial data for use in a geographic information system.

Importance to MMS Analysis of overflood and its implications for exploration and development requires information on both the temporal and spatial distribution of ice overflood from the breakup of North Slope rivers in the spring. This information is useful to determine how overflood limits affect pipeline and ice road routes and siting of gravel islands and exploration platforms. This information is also critical to the development of hydrological models to feed the ocean general circulation model for local forcing in the nearshore region of the Beaufort Sea. In addition this information could be used to assist in the development of ice models and their performance during breakup in the landfast ice zone.

Date Information Required: Data collection will be ongoing and the information will be fed into our data processing and analysis procedures. The data will be used for EISís for proposed Beaufort Sea Lease Sales in 2005 and 2007.

Revised Date: June 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Competitive or Interagency

Title: Hydrological Modeling along the Alaskan Arctic Coast

Period of Performance: FY 2004-2006

Description:

Background There is a strong need to focus on hydrological observations and processes to determine river runoff along the Arctic coast. These include terrain elevation, terrain ground cover, precipitation, snow drifting, and melting. For the North Slope of Alaska, this is more of graphical/GIS analysis of runoff and aquifer or ground water system modeling. The fresh water input is important locally because it controls breakup of nearshore ice, timing of release of spilled oil from landfast ice, and defines the water mass properties and dynamics of the nearshore shelf, particularly within or near barrier islands. This inshore area is the area of highest interest to oil industry.

Changes in the timing and amounts of river runoff to the arctic shelves may have an effect on the circulation. A fair amount of work has been done in the Kuparuk River watershed, but this is a small portion of the entire Arctic coast. This work has focused on understanding the fundamental hydrological processes in this small watershed.

Objectives The objective of this project is to develop a hydrological model of river runoff that would be incorporated into a general circulation model. The model would incorporate the first order hydrological processes to estimate river runoff into the Arctic Ocean primarily along the Beaufort Sea coast.

Methods

1. Synthesize existing information on hydrological modeling of Arctic watersheds.
2. Quantify first order hydrologic processes along the Alaska Canada Arctic coast from approximately Icy Cape to the McKenzie Delta.
3. Develop hydrological model incorporating first order hydrologic processes.
4. Synthesize existing hydrographic data for model validation.
5. Provide model code and documentation.

Importance to MMS The incorporation of river runoff into a general circulation model is important to advance the current fields in the nearshore region. Since very few rivers along the Arctic coast have gauges it is important to develop a physically based hydrologic model that can be used to predict the temporal variation river runoff.

Date Information Required: Data collection will be ongoing and the information will be input to our databases. Starting the model in FY 2003 would allow for the planned incorporation of the model into a potential additional phase of work on the ongoing CMI study of the Beaufort oil spill model, Nowcast/Forecast Model for the Beaufort Sea Ice-Ocean-Oil Spill System. The information will be used in EISís for probable Beaufort Sea Lease Sales in 2005 and 2007.

Revised Date: June 2002

Region: Alaska

Planning Areas: Norton

Type: Competitive

Title: Norton Basin Planning Area Circulation and Oil Spill Trajectory Model

Period of Performance: FY 2004-2005

Description:

Background MMS proposes to lease within the Norton Planning Area from an annual nomination process. Although MMS expects the nomination process to result in primarily exploration and production of gas for local use, this expectation does not preclude the need for oil spill risk analysis tools. MMS does not have a functional oil spill trajectory model for the Norton Planning Area. Previous MMS contractors (RAND Corporation and Applied Science Associates) did develop circulation and oil spill trajectory models for the northern Bering Sea and Norton Planning Area in the late 1970ís through the late 1980ís, but these models are no longer functional, available to MMS, or state-of-the art.

Objectives The objective is to provide MMS with circulation modeling capabilities specific to the Norton Planning Area for use in NEPA assessments. This objective may be accomplished by providing one of the following: ocean circulation fields, a usable in-house circulation model, or in-house stochastic oil spill trajectory or fate (trajectory plus weathering) modeling capabilities/tools.

Methods Develop or adapt existing model(s) to provide ocean surface circulation fields or model suitable for oil spill trajectory modeling for any location in Norton Basin. Model output must be suitable as input to MMS oil spill risk analysis programs.

Importance to MMS The Oil-Spill-Trajectory Model is a cornerstone to regional NEPA analyses and oil-spill-contingency planning. Oil-spill issues involving or resolvable by the trajectory model constitute half the public comments submitted on EISís on proposed offshore oil and gas sales in the Alaska OCS Region. Model results are used to evaluate the risks and advantages of specific alternatives, and they are used to fine-tune protective lease-sale stipulations. The oil industry and MMS use the model results in preparation and review of postlease oil-spill-contingency plans. The Department of State used the model results to evaluate foreign policy implications of OCS activities. The U.S. Coast Guard uses model results in analysis of local, national, and international oil-transportation and spill-response issues. The Canadian and Alaskan oil industry and spill cooperatives have adapted portions of MMS circulation and trajectory models for their own application, including the placement of spill-response equipment.

Date Information Required: Information from this study will be used in preparing NEPA documents for leasing and exploration, development EISís, and in reviewing oil-spill-contingency plans for Norton Planning Area OCS and coastal facilities. *The Proposed Outer Continental Shelf Oil and Gas Leasing Program 2002-2007,* offers the area for nomination annually and proposes a lease sale in 2003.

Revised date: June 2002

ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive

Title: Distribution and Abundance of Kelp and Associated Species in Western Camden Bay

Period of Performance: FY 2004

Description:
Background The Alaska OCS Region conducted an Arctic Kelp Workshop during 1998 and participants made many recommendations for research. One recommendation concerned the sparse data on kelp communities outside Stefansson Sound. For example, in western Camden Bay, although patches of kelp were found near Flaxman Island, Konganevik Point, and the Warthog exploration site, the kelp community has not been studied in any detail. General surveys for kelp have not been undertaken in the rest of the western part of the bay.

Objective To determine the distribution and key characteristics of kelp patches in Western Camden Bay.

Methods
1. Survey the kelp patches using vessel-based side-scan sonar with global positioning system.
2. Conduct follow-up visual surveys by remotely operated vehicle or diver.
3. Survey from Flaxman Island eastward to Konganevik Point, between the 5 and 50 meter isobaths.
4. Focus the surveys on large heads or clumps of kelp, determining their location, and estimating density, approximate age, and the diversity of associated organisms.
5. Analyze the side-scan sonar records with computer software like Isis to determine the locations of large, old kelp heads.

Importance to MMS The study would provide information for agency review of future development plans and incorporation into any relevant environmental impact assessments. Data would be potentially useful for monitoring the effects of sedimentation from the Northstar and Liberty developments.

Date Information Required: Before 2005.

Revised Date: June 2002

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ENVIRONMENTAL STUDIES PROGRAM: ANNUAL STUDIES PLAN FY 2003

Region: Alaska

Planning Areas: Beaufort Sea

Type: Joint Funding /Interagency

Title: Status of Salmon Populations along the Beaufort Sea Coastline

Period of Performance: FY 2004-2007

Description:
Background ìPursuant to section 305(b)(2) of the Magnuson-Stevens Act, Federal agencies must consult with the National Marine Fisheries Service regarding any of their actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affectÖ.î Essential Fish Habitat (50 CFR 600).

Essential Fish Habitat (EFH) for the five Alaskan salmon species (king, sockeye, coho, chum & humpbacked) is defined as:

1. ìÖ all streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmonÖî

2. ìÖ all estuarine and marine areas utilized by Pacific salmon of Alaska origin, extending from the influences of tidewater and tidally submerged habitats to the limits of the U.S. EEZ.î

Accordingly, the U.S. territorial waters of the Beaufort Sea and associated watersheds have been designated as EFH for Pacific salmon of Alaska origin. As a result, proposed oil and gas developments in the Beaufort OCS require consultation between MMS and NMFS over the effects of such developments on EFH.

Although salmon EFH has been designated, salmon are rare in the Beaufort Sea. During the summer, adult pink and chum salmon are present in the Colville River, and its tributaries, and caught in small subsistence fisheries by Native Alaskans living in the area. Previous studies have not demonstrated significant numbers of adults of other species. Immature life stages and successful spawning have not been found in the Beaufort Sea area. Additional information about the status of salmon populations along the Beaufort Sea Coastline is needed so analysts can prepare quality, project-specific, EFH consultations, as well as, the anticipated programmatic EFH consultation supporting the Alaska Regionís next 5-year development plan. The budget for this study assumes 50 percent cost participation by other interested agencies.

Objectives

1. Locate and document the principle areas used by salmon near OCS developments in the Beaufort Sea.
2. Determine whether local streams or lakes are used for spawning by Alaskan salmon.
3. Determine whether local salmon populations are viable by documenting the presence of juvenile life stages in streams, lakes or along the coastline.

Methods This study has two phases, with the second phase being contingent upon recommendations resulting from analysis conducted in the first phase. In the first phase, the investigator will:

1. Conduct a literature review.
2. Assemble relevant traditional knowledge (TK) by reviewing existing archives and holding conversations with knowledgeable Natives. Prepare a synthesis report encompassing literature and TK.
3. Hold a workshop to review the synthesis document and determine whether research is needed. If research is needed, workshop participants would design a research project and recommend methodology to be used to conduct field investigations necessary to fill data gaps.
4. Prepare a report summarizing the advisory committeeís recommendations for field research, if additional research is needed.

In phase two, the investigator will:

1. Conduct fieldwork, as recommended using methodology and study designs developed in phase one.
2. Prepare a report updating information about salmon in the Beaufort Sea.

Importance to MMS If viable populations of salmon are found in the Beaufort Sea area, this important information would allow MMS and NMFS to better focus EFH consultations on specific locations and issues. If not, dialogues might be expected to result in modification of EFH designations and future consultation requirements. Regardless, this information is necessary to enable analysts to prepare adequate project-specific and programmatic EFH consultations.

Date Information Required: Information is needed as soon as possible for input in EFH consultations for NEPA documentation for proposed Beaufort Sea Lease Sale in 2005 and 2007 possible DPPs.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive or Interagency

Title: Distribution and Abundance of Spectacled Eiders in the Beaufort Sea

Period of Performance: FY 2004

Description:

Background Despite a substantial research effort in recent years, information concerning the numbers, distribution, and movements of postbreeding spectacled eiders in the Beaufort Sea is limited. This fact is repeated in numerous published articles, agency reports, and Federal Register notices, as well as the Fish and Wildlife Service Northstar Biological Opinion. This topic has been prominent in discussions of both Northstar and Liberty Projects.

Recent USGS-BRD studies tracking small numbers of eiders with satellite telemetry provide a preliminary indication of distribution and use of the Beaufort Sea by this species. Of 15 males tracked between June 10 and July 10, half traveled from Prudhoe Bay to the Chukchi Sea in the 3 days between satellite relocations, so no information on route or Beaufort Sea use was obtained. Five males spent 7-11 days in Harrison Bay and there were 6 relocations in western Simpson Lagoon. Females occupy Beaufort marine habitats over a more extended period, from late June to mid-September. Of 13 post-breeding females tracked, 10 were located at least once before they arrived in the Chukchi Sea. Relocations indicated an average residence period of 4 days. Little use is made of marine habitats by either sex prior to these molt migrations (TERA 1999). Additional eiders are expected to be instrumented in the 2001 field season.

Satellite-tag studies provide useful information on areas visited by individual birds and timing of visits; however, it is not possible to determine the abundance of birds at such locations, and thus their importance to the Beaufort population, without visiting them. The lag in data transmission and processing inherent in satellite studies makes it impractical to visit such areas with the expectation of determining the numbers of birds present at time of transmission. Limited data of this type was collected during systematic aerial surveys by Fish and Wildlife Service between the Kogru River and Mikkelsen Bay: 4 spectacled eiders were recorded at 2 locations in 1999 and 144 at 5 locations in 2000, mainly in the Harrison Bay-Simpson Lagoon area.

Objectives The basic goal of this study is to determine the timing and extent of use of Beaufort Sea waters by spectacled eiders staging prior to their annual molt migration. This effort will require accomplishing the following objectives:

1. Instrument individual eiders with VHF transmitters.
2. Document the chronology of transition from terrestrial (nesting) to marine habitats.

3. By tracking instrumented individual eiders from ground stations and direct observation from aircraft, document the timing of spectacled eider dispersal to and use of specific local Beaufort Sea areas, the residency time of staging males and females in these areas, the numbers of birds present, and to the extent practical, movements of eiders in local areas.

Methods This project is expected to require the annual effort of a minimum of 3 persons in the field for 4 weeks, including aerial surveys for 10 days (4 hr/day), to locate prospective individuals for instrumentation. Scientists will:

1. Locate individual eiders on nesting areas, using ground search and/or aerial survey techniques.
2. Instrument eiders from several central Beaufort Sea areas.
3. Use standard techniques to capture, handle, and instrument eiders.
4. Use standard radio-telemetry and aircraft-following techniques to determine timing of use, residency times in local areas, numbers of eiders using such areas, and movements in local areas.
5. Scientists will put data on eider distribution, residency, movements, and abundance will be put in a format importable into ArcView and TIMS Oracle databases.

Importance to MMS The issue of spectacled eider vulnerability is expected to resurface with Liberty, future developments and future EISís. Spectacled eiders are listed under the Endangered Species Act and therefore are a resource of special concern. The MMS needs to be better able to estimate the risk to this species and provide mitigation for situations with potential for significant incidental take. This radio tagging/tracking effort will gather information specific to the seasonal distribution and abundance and marine habitat use by spectacled eiders. This information will be used to estimate risk to the species.

Date Information Required: This information is required prior to issuance of permits for construction development projects and for EISís for proposed Beaufort Sea Lease Sales in 2005 and 2007.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive

Title: Field Testing and Evaluation of Bird Hazing Techniques

Period of Performance: FY 2004

Description:

Background The most severe effects of a marine oil spill occur when oil contacts organisms. Therefore, it seems intuitively clear that most adverse effects of a spill could be avoided if contact between organisms and oil is prevented. This may be accomplished either by containing and recovering the spilled oil (e.g., booms, skimmers), although complete prevention of contact is difficult to achieve using these devices, or by dispersing organisms away from the spill area. Because most birds tend to avoid areas where loud or other disturbing human activities are occurring, they would appear to be susceptible to techniques that include such stimuli employed to disperse them away from a spill area. Currently, several devices and techniques are available that may be used to haze birds away from a spill area or render the area sufficiently unpleasant that they will avoid it (Greer and OíConnor, 1994; Koski, Kevan, and Richardson, 1993; Ward, 1977). However, none of these has been rigorously tested under conditions that likely would prevail if an oil spill occurred in the Beaufort Sea (Biggs, Sverre, and Boisvert, 1978; Hounsell and Reilly, 1995; Lehoux and Balanger, 1995; Mitchell, 1999; Ward, 1978; Whissom and Takekawa, 1998). Thus, it would be advantageous for field test results indicating the advantages and constraints of available hazing techniques (Lehoux and Bordage, 2000) under a variety of Beaufort Sea conditions to be available for oil spill response planning in this area.

Objectives The primary goal of this study is to provide Beaufort Sea-specific information regarding the effectiveness of various techniques and devices that may be used for hazing birds from the vicinity of an oil spill. Specific objectives are to:

1. Quantitatively field test bird deterrent devices and techniques (e.g., Breco buoy, gas cannon, aircraft, boat, cracker shell) for effectiveness in hazing birds varying in flock size, molt status, sex, and age from areas of varying size and ice conditions in the Beaufort Sea.
2. Field test bird deterrent devices and techniques for effectiveness in hazing birds from an area simulating an oil spill in the Beaufort Sea of the most likely volume assumed and discontinuous area projected in the Liberty EIS.
3. Develop a detailed Beaufort Sea bird-specific oil spill contingency plan incorporating all devices and techniques found to contribute substantially, either individually or in combination or in sequence, to deterrence of birds present in varying numbers and status from an area under a variety of oceanographic conditions and oil spill scenarios.

4. Make recommendations for any changes to the ACS Technical Manual and Oil Discharge Prevention and Contingency Plan procedures and equipment necessary to potentially reduce oil spill mortality of birds to acceptably low levels.

Methods Several bird deterrent devices and techniques have been tested for effectiveness (citations above), but none under specific biological, oceanographic, or climatic circumstances likely to prevail in the Beaufort Sea. However, those studies provide a background for field testing and evaluating the effectiveness of available devices and techniques. Specifically, this study will:

1. Select a suite of bird deterrent devices and techniques potentially effective for hazing birds present in the Beaufort Sea using published and unpublished literature on this topic, and demographic, annual cycle, distribution/abundance, and behavioral information for focal species (e.g., long-tailed duck, common eider, king eider, spectacled eider, loons, phalaropes) to establish selection criteria.
2. Expose bird groups of varying size, species, and status (e.g., molting, nonmolting) under various oceanographic conditions (e.g., open-water, broken-ice, fog), timeframes (hours, days), and at various times during the period of presence (May-October) to selected devices and techniques individually, and in combination and sequence; record numbers of individuals remaining at what distances, and/or other appropriate measures of effectiveness.
3. Repeat the exposure experiments substituting a simulated oil spill scenario and utilizing multiple devices and/or techniques over an area comparable to that projected to occur after 10 days as a result of spilling the most likely volume of oil assumed by MMS in the Liberty EIS.
4. If feasible, repeat the exposure experiments as an integral part of the Joint Industry Project ìFull Scale Experimental Oil Release in the Barents Sea Marginal Ice Zoneî with primary focus on evaluating alternative response strategies for oil spills in ice.
5. Develop a detailed Beaufort Sea bird-specific oil spill contingency plan incorporating recommendations for any changes to the ACS Technical Manual and Oil Discharge Prevention and Contingency Plan procedures and equipment necessary to potentially reduce oil spill mortality of birds to acceptably low levels.

Importance to MMS MMS requires this information in order to recommend changes in oil spill contingency plan procedures to more effectively reduce oil spill bird mortality to acceptable levels than would current procedures.

Date Information Required: Study information will be used for environmental assessment and monitoring Northstar and Liberty projects in 2003 and beyond.

Revised date: June 2002

Region: Alaska

Planning Area: Cook Inlet

Type: Interagency or In-house

Title: Distribution and Abundance of Beluga Whales in Cook Inlet during Winter

Period of Performance: FY 2004-2005

Description:

Background Noise from vessel traffic associated with oil development activities might potentially disturb and displace belugas from preferred habitat areas. Because the Cook Inlet population, currently estimated at less than 300 whales, has declined sharply over the past several years, the National Marine Fisheries Service (NMFS) has proposed listing this population as depleted and/or threatened. MMS in-house aerial surveys conducted in February-March 1997 suggest the area around Kalgin Island and East Forelands in upper Cook Inlet may be important habitat for this geographically isolated population during the late winter period. Comprehensive transect surveys across winter months are needed to confirm the importance of this area. Satellite transmitters will be used to monitor individual whales to augment survey data in determining the importance of upper Cook Inlet as winter habitat for the Cook Inlet population.

Objectives The primary goal of the study is to determine areas of Cook Inlet important to beluga whales during winter months. Specific objectives are to:

1. Determine relative abundance of beluga whales in various winter months by designing and implementing a protocol of repeatable aerial transects.
2. Determine whether relative abundance is correlated with ambient ice conditions, bathymetry, water temperature, currents, tides, fish runs, etc.
3. Monitor movements and habitat utilization by individual whales during winter.

Methods

1. Aerial surveys would be based out of Anchorage, Alaska. We anticipate the use of flights during optimal weather conditions to result in 10 surveys completed during November-December, 10 during January-February, and up to10 in late March. The sample design would consider dedicating a higher percentage of effort in survey blocks where beluga whales have been observed previously. The design must account for expected unfavorable survey conditions in parts of Cook Inlet on any given day. Wider surveys of lower Cook Inlet, Kodiak, and Shelikof Strait during the winter would also be considered. Incidental sightings of other marine mammals would be recorded.
2. Up to 30 whales would be captured using standard techniques and instrumented with satellite transmitters attached to a nylon saddle and pinned through the skin and blubber to

the dorsal ridge. Data will be obtained from ARGOS or other appropriate satellites and analyzed using GIS software.

3. A report will be written presenting the information collected.

Importance to MMS The study will provide information on the winter distribution and habitat use of beluga whales in the Cook Inlet-Gulf of Alaska OCS Planning Area for future oil-and-gas leasing, and potentially Section 7 Consultation with NMFS if the population is declared ìthreatenedî under the Endangered Species Act. The beluga whale is currently an important subsistence species for indigenous people of Cook Inlet, especially those from Anchorage, MatanuskañSusitna, and Kenai Boroughs.

Date Information Required: The information is needed to develop the next Cook Inlet Endangered Species Act Biological Evaluation and EISís for Cook Inlet Lease Sale proposed in 2004 and 2006.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin,

Type: Interagency or Competitive

Title: Predicting Polar Bear Denning Sites Using Topography, Wind Direction, and Wind Speed

Period of Performance: FY 2004

Description:
Background Female polar bears (*Ursus maritimus*) occupy maternity dens that are frequently located on land on the North Slope of Alaska. The location of these land dens varies with local snow conditions. There has to be sufficient snow depth for the construction of a maternity den. The North Slope of the Arctic is classified as a desert based on the very low amount of annual moisture.

Objectives To create a model for prediction of the location of polar bear maternity dens based on snowfall, wind direction and speed, and other factors as needed.

Methods
1. Collect information on past polar bear locations, weather information, and topography on the North Slope and incorporate the information into a ArcInfo-Arcview program.
2. Use statistical methods to correlate den locations with topography, snowfall, wind speed and direction.
3. Construct model to predict favorable local conditions (snow depth) during a given winter season.
4. Include in the model current weather conditions on snowfall, wind direction, and speed.

Importance to MMS During the environmental review of Sale 170 EIS, Liberty PDEIS, and NPRA EIS, Fish and Wildlife Service and the public expressed concern regarding the potential disturbance and displacement of denning polar bears on the North Slope that would be associated with cumulative oil and gas activities in the Arctic. Information on current denning habitat conditions along with den surveys in these areas will help to mitigate potential disturbance of denning bears during seismic exploration, ice road construction, and facility locations associated with onshore and offshore oil exploration and development on the North Slope and in the Beaufort Sea.

Date Information Required: There is a pressing need for information to mitigate disturbance of denning polar bears as required under the Marine Mammal Protection Act in the Letters of Authorization (LOA) permitting the lethal or nonlethal take of polar bears. Oil companies

working on the North Slope and in the Beaufort Sea are required to have an LOA if their activities are expected to disturb or take polar bears. The Marine Mammal Protection Act requires mitigation of potential disturbance of denning bears. Future oil and gas activities on the OCS of the Beaufort and Chukchi Seas and support activities onshore have the potential to disturb denning polar bears. This study will help to mitigate effects on denning polar bears.

Revised Date: June 2002

Region: Alaska

Planning Areas: All

Type: Joint Funding

Title: Joint Funding Opportunities in Existing Marine Bird Studies

Period of Performance: FY 2004-2005

Description:

Background The MMS periodically learns from other federal agencies about short-term, lower cost (<$50K), partnership opportunities on existing marine bird studies initiated or underway by other agencies. Such proposal range from funding specific aspects of existing studies that are perceived to be of interest to MMS to funding specific products that would be used by MMS analysts. Some of these items address MMS issues and needs or would provide data of use to MMS in GIS and other analyses or data that is considered too narrow in scope to warrant a fully developed/funded MMS study. Examples of opportunities to jointly fund projects are equipping endangered short-tailed albatrosses and threatened Stellerís eiders with satellite transmitters to monitor their annual movements. These projects are relevant because small numbers of the albatross enter Alaskan coastal waters and small numbers of Stellerís eiders breed on the western North Slope.

Objectives The purpose of this study is to establish a protocol whereby MMS may enter into joint funding arrangements with other agencies to facilitate the acquisition of needed small-scale information and/or data.

Methods Joint funding agreements would be arranged through Inter-agency Agreements or Purchase Orders indicating the specific data collection that is proposed for funding by MMS, products that would be delivered (reports, journal articles, digital data), and the agreed funding level. MMS would potentially cost-share up to 25 percent of the total project cost(s).

Importance to MMS Data produced by such study tasks potentially would supply MMS with information needed to address issues that result from late-breaking legal, regulatory or political developments that were nonexistent or unanticipated during the preparation of the relevant MMS study profile. Such developments typically result from initiation of the NEPA process, court actions, publication of proposed and final regulatory rules, or the need to formulate mitigation procedures. Acquisition of issue-specific information in many cases would allow MMS to effectively resolve differing opinions with other agencies without protracted discussion.

Date Information Required: This has no due date, but we recommend the information that would result from funded tasks be available prior to initiation of EIS or other processes associated with future leasing/production in the relevant planning area.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive

Title: Bowhead Whale Feeding in the Central and Western Alaskan Beaufort Sea

Period of Performance: FY 2004-2007

Description:

Background The extent to which the bowhead whale population utilizes OCS areas in the eastern Alaskan Beaufort Sea for feeding, as well as this areaís importance to individual whales, has been fully characterized in an MMS Study completed in 2001. In their 2001 Arctic Region Biological Opinion, National Marine Fisheries Service made a Conservation Recommendation that MMS continue to study ìthe use of the Beaufort Sea by feeding bowheads and assess the importance of this feeding to the health and well being of these animals.î At annual Open Water Arctic Peer Review Workshops, the North Slope Borough representative has consistently recommended that MMS expand the scope of the current feeding study to include the entire Alaskan Beaufort Sea. This study repeats key components of the eastern Beaufort study in order to characterize the importance of feeding habitat in the central and western Alaskan Beaufort Sea.

Objectives The overall goal of the study is to determine the distribution and relative importance of the central and western Alaskan Beaufort Sea as feeding areas for bowhead whales. Specific objectives for accomplishing this goal include:

1. Quantify real-time bowhead whale feeding in the central and western Alaskan Beaufort Sea over a 3-year period.
2. Assemble historic data and traditional knowledge on known feeding areas in the study area.
3. Use collected information, historic information, traditional knowledge, and information collected for the eastern Alaskan Beaufort Sea to quantify the relative importance of the central and western Alaskan Beaufort Sea as feeding areas for bowhead whales.

Methods The study would use methods similar to those used for the eastern Alaskan Beaufort Sea. The study would focus on analyses of stomach contents at Barrow and Cross Island, behavioral observations by aircraft, plankton tows by small vessel, radio isotope ratios in baleen annuli, fatty acid comparisons, recording of traditional knowledge, and computer modeling of feeding information. Real-time distribution of whales in the Beaufort Sea, as well as historic information on bowhead whale feeding activity in the study area, would be provided by the ongoing MMS ìBowhead Whale Aerial Survey Project.î Scientific information collected would furnish inputs to a model similar to that used to determine the importance of the eastern Alaskan Beaufort Sea as a feeding area for bowhead whales. Scientific permits would be obtained for all

fieldwork. The study would be carefully coordinated with the Alaska Eskimo Whaling Commission and Whaling Captains Associations in Barrow and Nuiqsut to avoid interference with fall subsistence hunts and, where feasible, to involve whaling communities in the conduct of the study.

Importance to MMS The potential disturbance to bowhead whales by oil- and gas-industry activities and the importance of portions of the Alaskan Beaufort Sea to feeding bowhead whales was a partial basis for an MMS decision to adopt the Beaufort Sea Sale 144 Barter Island Deferral option. With additional information on the importance of the study area to feeding bowhead whales, alternative mitigation options for future Beaufort Sea lease sales may be feasible. Information from the study also addresses potential critical habitat questions. Also it addresses Conservation Recommendation in National Marine Fisheries Serviceís 2001 Arctic Region Biological Opinion that MMS study ìthe use of the Beaufort Sea by feeding bowheads and assess the importance of this feeding to the health and well being of these animals.î Study information would also be used in the event that laying an underwater gas line is approved for the central Beaufort Sea.

Date Information Required: Information on the importance of the central and western Alaskan Beaufort Sea as feeding areas for bowhead whales is needed for post-lease permit approvals for all Beaufort Sea sales (Sales BF, 71, 87, 97, 124, 144, and 170). The information also needed for NEPA documentation for the proposed Beaufort Sea Lease Sales in 2005 and 2007.

Revised date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin

Type: Interagency or Competitive

Title: Distribution and Abundance of Denning Polar Bears in the Point Lay/Epizetka River Area

Period of Performance: FY 2004

Description:

Background Female polar bears (*Ursus maritimus*) occupy maternity dens that are frequently located on land on the North Slope of Alaska. The location of these dens varies with local snow conditions. At a minimum, there must be sufficient snow depth for the construction of a maternity den. Inland habitat, southeast of Point Lay near the Epizetka River, has been identified as having potential for polar bear denning. Natives have reported denning by polar bears (Kalxdorff 1997) and BRD satellite tracking data indicated that at least one den site was in this area. Moreover, topographic features found in that area appear to have excellent potential for the collection of snow in depths sufficient for polar bear den construction. The prevailing wind direction during October and November, when the bears are constructing their dens, is out of the east or west. Thus, relatively deep snow is expected to collect in the north facing troughs along the 100-foot contour lines in this area. Future development of oil or gas resources in the Point Lay area has the potential to cause disturbance to bears during construction or use of ice-roads or resultant from noise seismic exploration or frequent helicopter/aircraft overflights.

Objectives

1. Determine the distribution and abundance of polar bears and maternity dens in the Point Lay/Epizetka River area. Delineate any areas having concentrations of dens.

Methods

1. Have conversations with Native residents of the Point Lay area to determine the extent of their observations of polar bears inhabiting or denning locally; record locations of observations
2. Conduct aerial surveys of polar bears in the Point Lay/Epizetka River Area during the spring emergence of female bears with cubs from their dens (mid-March to mid-April)

Importance to MMS There is a need for information to mitigate disturbance of denning polar bears as required under the Marine Mammal Protection Act in the Letters of Authorization (LOA) permitting the lethal or nonlethal take of polar bears. Oil companies working on the North Slope and in the Beaufort Sea are required to have an LOA if their activities are expected to disturb or take polar bears. The Marine Mammal Protection Act requires mitigation of potential

disturbance of denning bears. Future oil and gas activities on the OCS of the Beaufort and Chukchi Seas and support activities onshore have the potential to disturb denning polar bears. This study will help to mitigate effects on denning polar bears. The information from this study would also be useful for evaluation of the effects of oil and gas development on polar bears in the western portion of the NPR-A and North Slope in the context of the ìcumulative effectsî of Beaufort Sea and Chukchi Sea development on polar bear populations. Furthermore, this study would provide potentially useful information for evaluation of issues related to ìenvironmental justice.î

Date Information Required: To support Beaufort Sea Sales in 2005 and 2007, and a Chukchi Sea Sale in 2007: to support development of mitigation to reduce cumulative effects of development in western NPR-A after 2003.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea and Chukchi Sea

Type: Competitive

Title: Sociological and Visual Documentation and Analysis of the Bowhead Whale Subsistence Hunt

Period of Performance: FY 2004-2005

Description:

Background The Beaufort Sea bowhead whale subsistence hunt has a centuries-long history and continues to be an important organizing feature of life in Alaskan North Slope villages. The technology with which the hunt is implemented is continually changing, but its basic aspects and associated social practices have remained relatively constant over time. Meanwhile, various other aspects of North Slope life have changed dramatically during the last century. These changes relate to large-scale sociopolitical and economic events and processes, with implications for the whale hunt. Examples include institution of Alaska Native Claims Settlement Act and the International Whaling Commission and its quota system, and the arrival of oil industry and associated revenue.

Modern IÒupiat hold fast to traditional subsistence practices amidst the many influences of modernity. The whale hunt arguably is the most important of these practices. Modern-traditional dynamics related to the hunt constitute an important area of research relevant to OCS decision-making processes. MMS is addressing perceptual aspects of such issues with survey-focused research. A sociological study will complement that work to enable fully comprehensive analysis of these important issues. A well-defined and germane focus for the study will derive from key findings of the MMS study titled ìQuantitative Description of Potential Impacts of OCS Activities on Bowhead Whale Hunting Subsistence Activities in the Beaufort Sea.î

Objectives The objective of this study is to provide an sociological and visual documentation of the subsistence whale hunt as a baseline for impact analysis and orientation for oil and gas industry workers active in the Beaufort Sea OCS Planning Area.

Methods The project will employ sociological and visual documentary methods to describe the subsistence whale hunt, explain its importance, and disseminate that analysis through film or video. A mix of project planning and social science research methods will be required as follows:

1. Identify a topical focus for the ethnographic study. This should involve review of previous MMS research including the study titled ìQuantitative Description of Potential Impacts of OCS Activities on Bowhead Whale Hunting Subsistence Activities in the Beaufort Sea,î and

key person interviews with Alaska Eskimo Whaling Commission leaders, whaling association leaders, and village elders.
2. Cooperate with North Slope institutions, leaders, and residents to complete a sustained period of sociological observation in the community of interest. Use participant observation, non-reactive, and interviewing methods to document the hunt and associated practices.
3. Based on the data collected in (2) above, describe the modern whale hunt, including associated observed and expressed problems, challenges, and rewards given modern economic/cultural influences.
4. Develop a comprehensive explanatory analysis of the data gathered in (2) above and factors described in (3) above. The analysis should effectively address the topical focus identified in (1) above.
5. Use state-of-the-art film technology and expertise to document those aspects of the whale hunt and associated social practices directly relevant to the analysis outlined in (3) above. The investigators will have achieved rapport with the hunters and deep familiarity with the subject matter and analysis through the many months of previous involvement in the project.
6. Edit and compile film footage to produce a film or video documentary of the whale hunt, associated practices, hunter narratives, and analysis of the challenges, rewards, and social implications of bowhead whale subsistence hunting in 21st century Alaska.

Importance to MMS One possible use of this study is to require operating crews on the Beaufort and Chukchi OCS to watch this visual documentation. This would help them to be sensitive to the bowhead whale subsistence hunt. This could be a mitigation measure. MMS also can use the products of this study to address OCSLA requirements, assist NEPA-document preparation, review oil-spill-contingency plans, facilitate outreach with North Slope communities regarding the MMS program, and review and formulate offshore policy for Alaska.

Date Information Required: This information is needed for NEPA documentation for proposed Beaufort Sea Lease Sales in 2005 and 2007, and review of exploration, development and production plans.

Revised date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, Hope Basin, Cook Inlet

Type: Competitive

Title: Worst-Case Blowout Occurrence Estimators for the Alaska OCS

Period of Performance: FY 2004-2005

Description:

Background The MMS has primarily used the historical spill record on the Outer Continental Shelf (OCS) as an indicator of future spill occurrence rates on the OCS. These data are supplemented in other ways, for example by engineering and fault tree studies of spill risk. Often as part of environmental assessments, MMS is tasked with providing analysis and probability of what at varying times has been know a worst case, catastrophic case, large-spill case, very-large-low-probability case spill. These low-probability statistics cannot be provided by MMS Field Operations or Resource Evaluation offices. In response to this issue, the MMS Technology Assessment and Research (TAR) Program initiated a study in 2000 to estimate worst case pipeline spills, primarily for the Gulf of Mexico, and considered, but was unable to extend that study to cover blowouts. The study described here will similarly evaluate the probabilities of occurrence of blowouts larger than have ever occurred on the U.S. OCS.

Objectives

1. Derive statistical/engineering procedures to extrapolate occurrence rates for worst case OCS oil blowouts.
2. Develop model/algorithm that would allow desktop PC estimation of blowout size given a probability of occurrence and the probably of occurrence for a given blowout size.

Methods

1. Review existing worst-case blowout examples (probability, size, and basis) from regional (Alaska) oil spill contingency plans and environmental assessments.
2. Evaluate applicability of alternate approaches against data needs and availability for each approach. Give consideration to:
   a. Geological formation constraints.
   b. Environmental and geological hazards specific to individual planning areas and more local hazards that may effect size or likelihood of blowouts.
   c. How engineering design may affect size or likelihood of worst case blowouts.
3. Develop a model that provides blowout size or probability of occurrence, given the other parameter, for very large or worst case blowouts.
4. Coordinate this study with the TAR Program related studies.

Importance to MMS The Oil-Spill-Risk Analysis (OSRA) is a cornerstone to regional EISís environmental assessments, and oil-spill-contingency planning. Oil-spill issues constitute a significant portion of public comments submitted on sale or development EISís in the Alaska OCS Region.

Date Information Required: Information from this study will be used for NEPA documentation for proposed Beaufort Sea Lease Sales in 2005 and 2007, Cook Inlet Lease Sale in 2006, and Chukchi/Hope Basin Lease in 2007 and in reviewing oil-spill-contingency plans.

Revised Date: June 2002

Region: Alaska

Planning Area: Cook Inlet

Type: Joint Funding/Interagency

Title: Cook Inlet Research Project Tracking System

Period of Performance: FY 2004

Description:

Background Most of the common problems facing the public, researchers, and managers in Kachemak Bay and all of Cook Inlet is the poor understanding of the research needs, and the public understanding what agencies are doing. MMS could cooperatively support the development of a sustainable tracking system to identify and track research, monitoring, and agency management/planning activities for Cook Inlet and its watershed. This project would coordinate very well with the Cook Inlet Information Management and Monitoring System (CIIMMS) and other organizations such as the Kachemak Bay National Estuarine Research Reserve (KBNERR). CIIMMS is coordinating efforts with other agencies as a single web-based source of information for Cook Inlet. The *Exxon Valdez* Trustee Council is supporting this effort. Several organizations are contributing to CIIMMS

Objectives The goal of this study is to develop a computer web-based tracking system that will receive information from government agencies and organizations studying Cook Inlet and its watershed. The system will be installed on a single site that is accessible to the public and researchers. The system will accept information from all users and compile the project information into a database. The database will be searchable by all agencies, organizations and the public.

Methods

1. Develop a database structure that can capture project specific information on agency and other organizationsí activities.
2. Compile the information into a user- friendly database and interface for all constituents to access.
3. Develop a web-based search-engine for the project database.
4. Coordinate with the development of CIIMMS and the KBNERR project databases currently being developed for the purpose of studying the Cook Inlet and its watershed.

Importance to MMS A successful system to track the ongoing research in Cook Inlet and its watershed will allow MMS to focus its limited funding by acquiring only needed data, and working cooperatively with other agencies and organizations.

Date Information Required: Information from this study will be used for NEPA documentation for the proposed Cook Inlet Lease Sale in 2006.

Revised Date: June 2002

Region: Alaska

Planning Areas: Cook Inlet

Type: Competitive

Title: Investigation of Sand Waves in Lower Cook Inlet: A Study of Ocean Bottom Currents

Period of Performance: FY 2004

Description:
Background In the south-central part of Cook Inlet, under 60 to 90 meters of water, lies a vast blanket of sand, sculpted into large sand waves, up to 15m in height and 1 km in wavelength. Previous studies (Whitney and other, 1979, and Whitney and others, 1980) showed by precision comparison of side scan sonar and seafloor profiles collected 4 and 5 years apart over the exact same locations that these large features had not moved. Confirming or denying the static nature of these features by comparing their structure over a longer time period will significantly add to the knowledge of bottom currents in lower Cook Inlet near both the entrance to Shelikof Strait and to Kennedy and Stephenson Entrances.

This study is a marine acquisition program to collect selected grab samples along, and with, six new lines of side scan sonar and seafloor profile data in lower Cook Inlet to compare against the results of survey lines collected in 1973, 1977, and 1978. Previous work was conducted by the USGS Conservation and Geologic Divisions, in support of the Oil and Gas Lease Sale "CI"--the first sale in Cook Inlet. The 1973 data consists of six high-resolution profiler and side scan sonar lines shot by industry and formed the baseline for the 1979 study. The 1977 and 1978 data sets were collected by the USGS, and also consist of profile and side scan sonar data collected along the same tracks as the 1973 data set. Precise navigation allowed a comparison between the 1973 and the 1977-78 data sets and correlation of major bedform features from side scan sonar and profiler records which showed no relative movement of these large sand waves in a 5 year period. The researchers concluded that either the bedforms move during larger storms with a period greater than 5 years, or that these are relict features formed at a lower sea level and then stranded in deeper water as sea level rose 8,000 to 10,000 years ago.

Objectives The study will compare side scan sonar and sea floor profile records collected as part of this proposal with side scan sonar and profile records from the USGS surveys of 1973, 1977 and 1978. The purpose is to determine if these large sediment features have moved or changed their shapes or orientations. This will indicate the level of activity of bottom currents strong enough to entrain sand grains--generally greater than 2 cm/sec.

Methods The program will be conducted as follows:

1. Digitize navigation maps from 1973 and 1977-78 surveys and generate preplot maps for the new survey.
2. Contract and outfit a ship with a side scan sonar, a sea floor profiler, and a sediment sampling device. Conduct a survey over approximately one week.
3. Scan the side scan sonar and profile records from 1977 and 1978 and plot navigation way-points on them.
4. Analyze grain size of sand from grab samples collected along the profiles to calculate current speeds needed to transport the sand.
5. Analyze seismic as a continuation of the 1979 study using the same data and methods.
6. Identify similar features on the two sets of records.
7. If no correlation is recognized between the various record-years, then conclude that great movement has occurred since 1978.
8. Search storm records and database to establish the peak events in years since 1978.
9. If bedform features can be correlated between the record-years, then make measurements on each set of records to ascertain the difference between the two years.
10. Calculate and model transport parameters for the sand.
11. Compare records with correlative features, measure a relative displacement of features, and calculate net movement. Analyze bedform shapes to reveal net current and sediment transport directions.

Importance to MMS The study will be used to support the environmental assessment process in Cook Inlet. Oil spill modeling can be refined with information on the dynamics of these large bedforms by better understanding the deeper water near-bottom sedimentary processes and oil spill fate and effects of by predicting the location and relative residency times of the heavy oil fraction on the seafloor. In addition, valuable information regarding the sea level history of Cook Inlet and global climate change can be obtained. This unique opportunity to make a precise comparison of rare submarine sedimentary features for determining the dynamics of sea floor sediments and therefore long-term near-sea floor currents and possible sinks for pollutants. The information from this study is complimentary to MMS ESP studies of Cook Inlet sediment quality and ocean current circulation.

Date Information Required: The information from this study will be used for NEPA documentation for the proposed Cook Inlet Lease Sales in 2004 and 2006.

Revised date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive or Interagency

Title: Mapping of Ice Gouge and Strudel Scour Density for the Beaufort Sea Utilizing Existing Data

Period of Performance: FY 2004-2005

Description:

Background Quantitative information on ice gouge and strudel scour are sparse to non-existent in the Beaufort Sea. Ice gouge data was last collected on a regional basis over twenty years ago when instrument and navigation quality was less accurate than current technology. MMS has reviewed all of the available ice gouge and strudel scour data for site-specific surveys and development surveys in the Beaufort Sea. We have determined that there are insufficient interpreted data to predict the occurrence, extent and magnitude of these features. In addition, we do not know the relationship between overflood limit and the occurrence of strudel scour over most of the nearshore portions of the Beaufort Sea where offshore oil and gas pipelines may be located in the future. The data sets associated with magnitude of the occurrence of ice gouge and strudel scour are critical in the evaluating the degree of risk associated the building of pipelines to offshore fields in the Beaufort Sea.

These data tie into other recently collected site survey and development pipeline surveys compiled in the MMS Sub-sea Physical Environmental Database (SPED) for the Beaufort Sea. This study did not analyze existing MMS geophysical records present for quantitative data on ice gouge or strudel scour. There is a new proposal to collect ice gouge and strudel scour data for the proposed natural gas pipeline in the Beaufort Sea. These data if collected would be incorporated into the current database and analysis effort.

Objectives

1. Determine the density and degree of severity of ice gouging for all of the site-specific surveys in the Beaufort Sea utilizing the available MMS geophysical seismic records.
2. Map the strudel scours found within the site-specific surveys with MMS geophysical records (few if any).
3. Incorporate the new information into the SPED for the Beaufort Sea, Alaska.
4. Determine the ice gouge density across the Beaufort Sea Shelf based upon the mapped ice gouges and bathymetry.
5. Determine the statistical significance between ice gouge intensity, bathymetry and sea ice severity.

6. Update the current Graphical User Interface for the analysis of ice gouge, strudel scour (if observed) as they relate to bathymetry, and the concentration of sea ice.
7. Update the database documentation and data loaders.
8. Describe the methods for the collection and analysis of the data.

Methods

1. Map the density and magnitude of ice gouges for the Beaufort Sea using the available MMS geophysical seismic records and data.
2. Incorporate data into the current SPED.
3. Provide new tools within to query the newly established data.
4. Compare the occurrence of ice gouge to water depth and to the magnitude of sea ice using statistical methods.
5. Describe the methodology to analyze the data.
6. Provide final database, database documentation and database design based upon Coastal Offshore Resource Information System (CORIS) standards.

Importance to MMS This information will be used for future EISís in the Beaufort Sea. The information is needed to fill major data gaps in our understanding of the occurrence and intensity of ice gouging in the Beaufort Sea. MMS will be able to rewrite our understanding of ice gouge intensity, for potential pipelines such as for the proposed natural gas pipeline and for possible scenarios associated with Kuvlum and Wild Weasal prospects. These data may also be used by MMS to determine risk associated with the development of pipelines from shore based facilities.

Date Information Required: The interim and final information from this study will be used for NEPA documentation for proposed Beaufort Sea Lease Sales in 2005 and 2007. The information from the study will also be used for permit and planning decisions for proposed exploration and production plans.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive or Interagency

Title: Update Shallow Core and Sediment Sample Database for the Beaufort Sea and Determine the Extent and Concentration of Permafrost and Shallow Gas

Period of Performance: FY 2004-2005

Description:

Background The current Sub-Sea Physical Environment Database (SPED) should be updated with the remaining shallow core data for the Beaufort Sea continental shelf. The shallow core data are very important for understanding the shallow shelf stratigraphy, surface sediment types, location of permafrost, the velocity of sediments, existence of shallow gas, and for the identification of archeological sites. The shallow core data are also necessary for the design of offshore structures such as pipelines and for other structures that support exploration and development activities.

Currently, we have compiled over 200 shallow cores from the study titled ìSub-Sea Physical Environmental Database for the Beaufort Seaî (SPED). The spatial locations of the core data, and their attributes are located in an Oracle/Spatial Database Engine (SDE) database. These data will be accessible via ArcView and Arc/Info after the entire database has been loaded within the Alaska OCS Region. These data are very important for the determination of engineering and drilling constraints in the Beaufort Sea OCS.

Most of the data collected under the current study are site-specific. There were no regional data sets entered into the database. Approximately 50% of the remaining data are regional data sets. These regional data sets may tie together the information from the site survey data sets and provide a much clearer picture of the shallow sub-bottom. These data are from past USGS, State of Alaska and oil and gas industry studies. Some of the industry data collected under Federal OCS permit are proprietary and can only be used internally until those data sets are released to the public.

Objectives: The objective of this study is to compile the remaining shallow core data for the Beaufort Sea, Alaska into the SPED for the purpose of understanding the physical nature of the shallow sub-bottom under the Beaufort Sea. The following component objectives are to:

1. Update the current SPED to include all of the available shallow core and sediment data for the Beaufort Sea, Alaska.

2. Update the current database and user interface so that it can support the Alaska OCS Regionís assessment of proposed exploration and development sites, pipeline construction, archeological sites and location of permafrost and shallow gas accumulations.
3. Produce documentation that describes the borings portion of the database and provides a description of the capabilities of the database and user interface based upon the requirements set forth in objective 2.
4. Synthesize the results of the database compilation.

Methods: The following methods will be used to update the current SPED for the Alaska OCS Region:

1. Update the current borings portion of the SPED with all of the available shallow core data and sediment sample data from the oil and gas industry, government, and university research.
2. Create a Graphical User Interface for the database that enhances the analysis capabilities of the borehole portion of the database.
3. Update the data loaders for the entry of new core data.
4. Provide metadata in the current MMS Coastal and Offshore Resource Information System (CORIS) metadata format.
5. Provide documentation on the methodology on how the borehole data was compiled and how to query the database.
6. Describe those areas of permafrost, shallow gas and sediment types over the mapped study area.

Importance to MMS The information from the database will assist MMS analysts in determining the location of archeological sites, shallow gas, and the location and extent of permafrost prior to the approval of exploration and production plans. The data may be used to test hypotheses relating to the transmission of sound waves and potential acoustic disturbances from oil and gas activity.

Date Information Required: This database project will support MMS decision making for future oil and gas development projects in the Beaufort Sea and NEPA documentation for proposed Beaufort Sea Lease Sales 2005 and 2007.

Revised date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea, Chukchi Sea, and Hope Basin

Type: Joint Funding/Interagency

Title: Investigation of Sea Level and Climate Change in Arctic Alaska for the Past 20,000 Years

Period of Performance: FY 2003-2004

Description:
Background The history of past sea level stands during the past 20,000 years is complicated and inadequately understood in Arctic Alaska. Sea level has fluctuated from approximately 10 feet above to over 250 feet below its current level. Primarily, data from sea level investigations done by USGS in the Bering Sea Region during the mid-1960ís is still the standard used in all Arctic and subarctic Alaskan areas today. Recent academic research funded by National Science Foundations (NSF) and other national and international research organizations in Alaska and Siberia has shown that climate change and sea level are directly related and are much more temporally and spatially complex than previously thought. Because of this, general sea level curves for the Bering Sea Region constructed decades ago do not accurately reflect some sea level events in the Chukchi and Beaufort Seas.

Other national and international research programs and initiatives may provide partnerships for funding and research collaboration. These include:
1. Paleoenvironmental Arctic SciencesóArctic Paleosciences in the context of Global Change (PARCS).
2. International Marine Global Change Study (IMAGES).
3. Paleoclimate from Arctic Lakes and Estuaries (PALE).
4. International Arctic Research Center (IARC).

Objectives The objective is to coordinate an integrated program of onshore and nearshore landform mapping, and organic sample collection for age-dating along the northern Alaska coast to establish a higher resolution climate and sea level history for the past 20,000 years. This sea level history will help establish an up-to-date sea level curve that will serve as the basis for a much-needed new archaeological baseline study for the Arctic and Bering Sea OCS planning areas. In addition a high frequency sea level history will assist in the assessment of environmental changes, establishing whether they are naturally occurring or anthropogenically driven.

Methods

1. Thoroughly review existing studies and onshore topographic maps, aerial photographs, and satellite imagery, and offshore bathymetric maps for delineation of landforms possibly created or modified by smaller order higher and lower past sea level stands on the decennial and millennium scale.
2. Compile data and mapping of landforms.
3. Review relevant current and past micropaleontological and archaeological investigations.
4. Review existing data and select sites and areas for field investigations.
5. Conduct field investigations of onshore landform mapping, organic sample collection for age-dating, and documentation. Work from base camps along selected coastal locations, supported by helicopter and small watercraft.
6. Conduct concurrent nearshore fathometer transects for mapping bathymetry and seafloor sampling for micropaleontological, and sediment data using a small boat.
7. Compile field research and laboratory analysis. Integrate field data with data from existing maps and investigations including "Evaluation of Sub-Sea Physical Environmental Data for the Beaufort Sea OCS and Incorporation into a Geographic Information System (GIS) Database.î
8. Establish a new sea level database for the Regional archaeological baseline study.

Importance to MMS

1. Establishing a new and accurate sea level history is important for protection of archaeological resources by better understanding where people may have migrated, hunted, and established camps and settlements. Understanding and resolving higher frequency sea level fluctuations is critical to understanding the wider swings of rising and falling sea level that have affected the OCS.
2. Understanding the age, origin, morphology, dynamics, and stability of paleo-features and the ecological consequences of past sea level stands is useful in assessing subsea pipeline routes and areas of pipeline landfalls. It will also be useful for monitoring short-term and medium-term environmental effects on and of pipelines such as those proposed for offshore Beaufort Sea North Star and Liberty production areas.
3. This study will add information to sea level history and paleo-landform aspects of the MMS Sub-sea Physical Environmental Database.
4. Enhancing resolution of Arctic sea level changes is pertinent to the general study of climate change and essential to the increasingly focused study of Polar climate change. This will be useful in determining whether changes in the nearshore and shoreline environments are the result of naturally occurring cyclic events or are due to changes in human activities such as offshore oil and gas in the Arctic.

Date Information Required: This information is needed for NEPA documentation for proposed Beaufort Sea Lease Sales in 2005 and 2007, Chukchi/Hope Basin Lease Sale in 2007, and review of exploration, development and production plans.

Revised Date: June 2002

Region: Alaska

Planning Areas: Beaufort Sea

Type: Competitive

Title: GIS Internet Map Server (ARCIMS) Web Site for the MMS Sub-sea Physical Environmental Database (SPED)

Period of Performance: FY 2004

Description:

Background The Sub-sea Physical Environmental Database (SPED) for the Beaufort Sea, Alaska OCS Region is a compilation of all the available sub-sea environmental features. These features include the navigation, bathymetry, isopach, structure, strudel scour, ice gouge, shallow gas, Boulder Patch and borehole data. These data were collected by the oil and gas industry for site-specific exploratory well surveys and for the pipeline surveys over the last twenty years. The data are stored within an ArcView/Access database and accessible by all MMS analysts. These data are very useful to those companies who would want to participate in an oil and gas lease sale in the Beaufort Sea but are unfamiliar with the specific drilling and pipeline hazards there. The oil and gas industry may also utilize these data to plan for proposed pipeline surveys on their existing units or leased areas. Current companies planning large projects in the Beaufort Sea such as the proposed Natural Gas Pipeline Project can utilize these data products for planning and comparison purposes. Universities and international organizations can utilize these data for planning future research in the Beaufort Sea (e.g., currents, permafrost, etc.).

A Web-enabled GIS database and descriptive database is needed in order to provide important technical information to the oil and gas industry about potential geologic hazards pertaining to drilling and pipeline construction for the Beaufort Sea. The GIS Internet Map Server (ARCIMS) is an internet mapping software developed by Environmental Systems Research Inc. (ESRI). ESRI software will be used to query spatial information across the Beaufort Sea Shelf for any site-specific survey or pipeline survey done within Federal OCS waters. The database will be stored as ACCESS tables and as ArcView shapefiles. MMS will provide the necessary tools so that the public including industry can query the content of the database. This dynamic database will be updated, as new data becomes available

Objectives

1. Provide internet mapping capability within the Alaska OCS Region for SPED.
2. Provide access to the existing geohazard and geotechnical reports found in SPED.
3. Provide query tools with ARCIMS to query the available information contained with the SPED.

Methods

1. Compile the currently available information from the SPED and link the data to ARCIMS software for serving the data over the MMS web site.
2. Scan and convert to portable document file (PDF) the hard copy reports for the Beaufort Sea site-specific surveys, Boulder Patch Surveys, pipeline route surveys, and borehole surveys.
3. Link the spatial information from SPED to the hard copy documents of PDF files.
4. Establish query routines within ARCIMS to extract spatial information from the SPED and descriptive information from the site-survey and pipeline reports in PDF files.
5. Provide user documentation online.

Importance to MMS The MMS customer base of the oil and gas industry, government agencies, universities, the public and other potential customers will be connected to the most comprehensive database on oil and gas drilling and pipeline hazards database for the Alaska, Beaufort Sea. The ARCIMS and SPED will provide important decision making information to the oil and gas industry both within and outside Alaska. This information will provide quantitative ocean bottom and sub-bottom geophysical and geotechnical data to the oil and gas industry currently working in the Beaufort Sea and to those companies that may be planning to do so in the future. The geophysical information is shallow gas, shallow stratigraphic, structural, earthquake, etc. The geotechnical information is shallow borehole data on permafrost, sediment type, etc. Connecting the SPED to our customer base will provide them with better decisions making tools which will affect their future participation in the Beaufort Sea, whether it would be for future oil and gas activities, for research, or for other purposes.

Date Information Required: The ARCIMS database and SPED will provide information for NEPA documentation for proposed Beaufort Sea Lease Sales 2005 and 2007.

Revised date: June 2002

Region: Alaska

Planning Area: Beaufort Sea

Type: Competitive

Title: Cumulative Effects of Offshore and Onshore Oil and Gas Development on the Beaufort Sea Environment

Period of Performance: FY 2004-2005

Description:
Background Both offshore and onshore oil and gas exploration, development, and production activities are increasing across Alaskaís North Slope. Proposed in connection with the recommendation of the National Research Council's (NRC) committee on North Slope Cumulative Effects potential, several studies would address issues on cumulative effects raised by numerous stakeholders. Coastal indigenous peoples are particularly concerned about cumulative effects on onshore developments at the Kuparuk, Alpine, and Prudhoe Bay and potential NPRA oil fields in conjunction with offshore developments at Liberty, Northstar, and possible upcoming offshore lease sales. However, potential recommendation from the NRC may provide for the basis for this research.

Objectives The objectives are to:

1. Establish or augment baseline data on the natural and cultural environment.

2. Estimate cumulative effects of human interactions on Federal lands and resources.

3. Estimate cumulative effects on marine ecosystems, values species, and subsistence activity.

4. Provide effective data management and sharing capabilities.

Methods

1. To accomplish the objectives, we would structure planning (first year) and implementation (second year) phases for data collection addressing the following questions:

a. What are the regional baseline and trends of key sensitive marine species which might be affected by cumulative offshore and onshore oil and gas development in the Smith Bay, Harrison Bay, Simpson Lagoon, Prudhoe Bay, Foggy Island Bay, Mikkelson Bay and Camden Bay vicinities?

b. What are the cumulative effects of offshore and onshore oil and gas development on Beaufort Sea Outer Continental Shelf (OCS) marine ecosystems and valued species in the vicinity of the bays and lagoon cited in 1.a above?

c. What are the cumulative effects of offshore and onshore oil and gas development on (OCS) subsistence activities in the vicinity of the bays and lagoon cited in 1.a above?

d. To what extent can monitoring of oil and gas activities or of subsistence make mitigation on the North Slope more effective?

e. What traditional knowledge will help us understand cumulative effects of onshore and offshore oil and gas activities on outer continental shelf marine ecosystems and valued species in the vicinity of the bays and lagoon cited in 1.a above?

2. Cooperating/collaborating federal agencies for #a-d above are MMS, BLM, FWS, and BRD.

Importance to MMS This study is important to MMS because cumulative oil and gas activities are becoming an increasing concern and the information is needed to improve MMS decision making. This study addresses concerns of coastal indigenous people in the villages of Nuiqsut, Kaktovik and Barrow, particularly about cumulative effects of onshore and offshore developments. Other constituents, particularly in the environmental community, are concerned about cumulative effects also. The cumulative developments include: Kuparuk, Alpine, Prudhoe Bay; NPR-A leasing; offshore developments at Liberty and Northstar; and results of upcoming offshore lease sales.

Date Information Required: The timing of the study will be useful in monitoring effects of the Liberty, if approved, and Northstar developments. This study also will be used for NEPA documentation for probable lease sales in the Beaufort Sea in the *Final Proposed Outer Continental Shelf Oil and Gas Leasing Program 2002-2007* (July 2002). Current information on selected topics is available but some of them may be out of date or not have appropriate geography, season, or design considerations for this effort. This study probably will build on previous relevant studies.

Revised Date: June 2002

SECTION 3 Topical Areas for FY 2005

This section presents a general forecast of significant topical issues and concerns to be addressed by proposed studies for FY 2005 and beyond. In general, these topics conform with the research themes of the NSP. Due to the great differences existing between Alaska environments and other OCS areas, the uniqueness of issues in Alaska have dictated the need to anticipate new topical areas for needed implementation within the Alaska ESP. These projects will focus on MMS mission needs within the context of increasing industrial development and potential trends in changing climates. Specific geographic emphases are likely to change due to potential changes in leasing or development schedules.

Many of the studies proposed for FY 2003 and FY 2004 address the topical areas described below. These will be re-assessed as part of the FY 2004 planning process.

Offshore production started at Northstar in 2001. Industry proposes exploration in the Beaufort Sea and may propose development projects. MMS proposes numerous lease sales in the Alaska OCS in the *Final Outer Continental Shelf Oil and Gas Leasing Program 2002-2007*: 3 in the Beaufort Sea; 2 in Chukchi/Hope Basin; 2 in Cook Inlet/Shelikof Strait; and 1 in Norton Basin. For these reasons, it will be important to continue monitoring studies and other priority studies of key species and marine communities. Monitoring of bowhead whales will continue, and additional studies may be brought online which address ringed seals, kelp communities, fishes and migratory waterfowl. Studies will vary from description of behaviors and habitat to monitoring for changes. Additional studies of the physical environment such as current regimes and ice characteristics will be proposed to support interpretation of data from living resource investigations and to provide a better understanding of the fate and dispersion of OCS discharges.

Physical Oceanography

One of the emerging issues in the Alaska OCS Region, is the need for better, finer scale circulation and oil-spill models and higher resolution data for the nearshore portions of the Beaufort Sea. Multiple offshore oil fields have been developed (Endicott and Northstar), exploration efforts are accelerating, and development plan potentially can be submitted. MMS will be completing a nearshore Beaufort Sea ice-ocean circulation model in 2003. One goal is further development of this model into a nowcast/forecast ice-ocean-oil spill system for the nearshore Beaufort Sea.

Construction of such a system requires formation of a user group, higher data density, and ability to assimilate such data into the model in real-time. The Region will be working toward forming a users group to provide surface radar mapping capabilities and data for the nearshore Beaufort Sea and other Alaskan waters as needed. Over the past 25 years, oceanographic radar techniques have been developed and improved to the point

that detailed, grided, 2-dimensional maps of surface circulation can be provided and recorded in real time and directly assimilated into real-time models.

Additional improvements will also be needed in sea-ice aspects of the modeling. The resolution of ice models and ice data needs to be increased to address the fine scale interactions necessary to model oil spill trajectories in the nearshore Beaufort Sea and Chukchi Sea, including within and among the barrier islands. Ice models currently in use by MMS and others use relatively simple thermodynamics and ice thickness distribution, approximating the ice as slabs of a one to few thicknesses plus open water. While sufficient as a first approximation of the arctic ice pack, this treatment lacks the ability to sufficiently resolve the spectrum of ice thickness from thin new ice to thick-ridged ice to landfast ice. In addition, these ice models are based on empirical ice physics valid at a 100-km scale and extrapolated to smaller grid dimension. The MMS will work to improve the state of the art in ocean-ice modeling and to produce either a stand-alone model or one that can be coupled to and or nested in existing ice/ocean models.

Fate and Effects

The Region is collecting baseline biological and chemical monitoring data in the vicinity of the Liberty Prospect and Northstar as part to Arctic Nearshore Impact Monitoring in the Development Area (ANIMIDA). However, the last full field season for ANIMIDA is scheduled for summer 2002. With Northstar in production and the potential for other developments being proposed, there will need to be a follow-on monitoring effort to quantify construction and develop effects. A continuation for this study is proposed for FY 2003-2008. The frequency of sampling will probably be less than in the original years of the ANIMDA project. BPXA put its plan for developing the Liberty Prospect on hold in January 2002. It was the first oil development proposed for OCS waters in Alaska. However, collecting information at this site is useful for the long term monitoring continuity. Developments are possible at this site or others in the central Beaufort.

In addition to site-specific monitoring, there is a need to re-examine the regional contaminant levels in the U.S. Beaufort Sea. The MMS set up the Beaufort Sea Monitoring Program (BSMP) in the 1980's to monitor sediment quality. The BSMP monitors trace metal and hydrocarbon levels in sediments and benthic biota at specific locations on a regional basis. The ANIMIDA program has resampled BSMP stations locally near Northstar and Liberty, but not elsewhere. Regional BSMP sampling has not been done since 1989 and needs to be repeated.

The International Arctic Marine Assessment Program (AMAP) has recommended that additional contaminants be included in Arctic monitoring programs because of their increasing levels. Because of AMAP recommendations and Environmental Justice issues, mercury and persistent organic pollutants should be added to the BSMP analyte list.

Sea Bed and Sub-sea Bed Physical Processes

MMS has reviewed all of the available ice gouge and strudel scour data for site-specific surveys and development surveys in the Beaufort Sea. We have determined that there are insufficient interpreted data to predict the occurrence, extent and magnitude of these features. In addition, we do not know the relationship between overflood limit and the occurrence of strudel scour over most of the nearshore portions of the Beaufort Sea where offshore oil and gas pipelines may be located in the future. The data sets associated with magnitude of the occurrence of ice gouge and strudel scour are critical in the evaluating the degree of risk associated the building of pipeline to offshore fields in the Beaufort Sea. These data tie into other recently collected site survey and development pipeline surveys compiled in the MMS Sub-sea Physical Environmental Database (SPED) for the Beaufort Sea.

The SPED should be updated with the remaining shallow core data for the Beaufort Sea Continental Shelf. The shallow core data are very important for understanding the shallow shelf stratigraphy, surface sediment types, location of permafrost, the velocity of sediments, existence of shallow gas, and for the identification of archeological sites.

In the south-central part of Cook Inlet, under 60 to 90 meters of water, lies a vast blanket of sand, sculpted into large sand waves, up to 15m in height and 1 km in wavelength. Previous studies (Whitney et al., 1979, and Whitney et al., 1980a and 1980b) showed by precision comparison of side scan sonar and seafloor profiles collected 4 and 5 years apart over the exact same locations that these large features had not moved. Confirming or denying the static nature of these features by comparing their structure over a longer time period may add to the knowledge of bottom currents in lower Cook Inlet near both the entrance to Shelikof Strait and to Kennedy and Stephenson Entrances.

Endangered and Protected Species

Production at the Northstar site and OCS activities possible at other sites may lead to risks of oil spills from buried pipelines, other discharges, noise from various industrial and support activities and increased human interaction with arctic offshore species. Species protected under the Endangered Species Act (ESA), Marine Mammal Protection Act, and Migratory Bird Treaty Act are of particular concern if impacted by such factors. Study of the effects on endangered marine mammals, and the need for continued monitoring of fall bowhead whale migrations are expected to be continued ñ especially research on how any changes in the bowhead whale migrationís distance from shore could relate to subsistence success (see below). Future bowhead studies are expected to continue to explore use of satellite tagging for information on bowhead whale residence times in development areas and information on bowhead behavior in response to industrial noise. Also needed will be continuation of vital region-wide fall monitoring of the migration by the MMS Bowhead Whale Aerial Survey Project (BWASP) and additional knowledge it obtains on bowhead feeding patterns.

Effects of construction activities on polar bears, especially on denning bears and concerns about the adequacy of information about all age/sex categories of the bear population will need to be addressed by additional research. Several ongoing studies are expected to lead to recommendations for additional information regarding polar bears and continued study of the bear populationís vulnerability to oil spills through improved models.

Also, research on waterfowl migration corridors across the Beaufort nearshore zone will be needed to better define migration corridors and improve impact mitigation. For example, offshore structures constructed in migratory corridors would increase waterfowl collisions with such structures. Of concern are endemic eider species, old squaw, and other waterfowl.

Other key subsistence species potentially exposed to short-term or cumulative impact factors include beluga whales, ringed seals, and bearded seals for which behavioral or monitoring studies will be needed.

Effects on Unique Marine Benthic Communities

Pipeline construction and other activities may generate sediment plumes that could potentially impact the unique ìBoulder Patchî benthic community, known to cover an extensive area to the northwest of the Liberty site in Stefansson Sound. This is a boulder-strewn seabed area with a kelp-dominated community. Similar areas are known to exist to the east in Camden Bay. Some kelp plants in the Boulder Patch are up to 40 years old. Ongoing studies in the ANIMIDA project are studying kelp productivity and will use inherent optical properties of ice and water to determine the impact of sediment resuspention on kelp productivity. Optical-related measurements will include spectral irradiance, light scattering coefficients, and total suspended solids. Results of this work will be used to determine future information needs related to this issue. Research on invertebrate and vertebrate components of this community and refined development of monitoring protocols are anticipated for the future.

Marine Fish Migrations, Recruitment and Essential Fish Habitat

Nuiqsut villagers are concerned that OCS activities have affected arctic cisco populations in the Colville River and reduced subsistence utilization. Data in recent years has been spotty due to the completion of relevant causeway studies. Until more consistent time-series data regarding wind-driven recruitment of young-of-year arctic cisco and recruitment of that population are available, offshore oil and gas development could be considered the potential impact-causing factor. Thus, additional research on near-shore arctic fisheries and recruitment to Colville River populations should be initiated.

Proposed and recent pipeline construction in the Beaufort nearshore have led to concerns about effects of trenching and back-filling on fish populations and habitats. Several important fish species used for subsistence migrate through or are found in the Northstar and Liberty areas, including arctic and least cisco, Dolley Varden char, and humpback

and broad whitefish. Also, intermittent occurrences of pink and chum salmon may be found in Beaufort coastal waters. As a result of the Magnuson Fishery Conservation and Management Act, Beaufort waters are considered as Essential Fish Habitat (EFH) for endemic salmonids. Future research establishing the significance of salmonid reproduction in drainages to the Beaufort sea may be necessary in order to clarify environmental assessment and mitigation needs.

Biotechnology Potential

One day soon the search for oil and gas on the OCS may be joined by the search for genetic and biochemical resources found in marine organisms. Such materials could one day lead to new therapeutic drugs for fighting cancer, AIDS or heart disease. Many DOI bureaus are coming to terms with the possibility of locating, conserving, and licensing the natural products of their trust resources.

The MMS has had a long history of studying the ecology of platforms and currently the MMS Gulf of Mexico and Pacific Regions are conducting studies through their CMIs to examine the availability and distribution of bioharvestable marine organisms on OCS structures. Thus far, several ìcandidateî organisms producing possible therapeutic natural products have been identified. One candidate organism, the bryozoan, *Bugula neritina*, lives in the Gulf and potentially could be commercially harvested from OCS platforms. This organism produces a chemical, Bryostatin 1, which is in Phase II trial testing as a treatment against non-Hodgkinís lymphoma and chronic leukemia. If OCS platforms can be shown to be a ready source for this organism, then MMS may be dealing with this emerging issue in a significant way. As these MMS Gulf and Pacific Regional studies progress, the Alaska OCS Region will be considering whether similar research efforts should be initiated on the Alaska OCS.

Subsistence

Inupiat of the North Slope have repeatedly in recent years expressed concern about cumulative impacts of offshore and onshore developments on their subsistence lifestyle. The Inupiat villages of most concern are Kaktovik, Nuiqsut, and Barrow. Consideration of cumulative impacts is an increasingly important issue from a legal standpoint for MMS in preparing NEPA documents. Some of the concerns of the Inupiat are access to hunting and fishing areas being limited by oil industry infrastructure, reduced harvests, increased hunter efforts, and increased hunter cost. How and to what degree subsistence activities have been affected over the last 10 years or so by industry infrastructure and industry activity should be studied.

Related to the long-term study of the cumulative effects of oil industry on subsistence is a broader set of measures of how the Inupiat society has been affected. Aspects such as how the cash component of households affects participation in subsistence activities, stress, sharing of subsistence resources and participation of younger Native in subsistence

compared to their elders. Such social indicators should be studied to serve as a basis for determining long-term cumulative impacts.

Socioeconomic Change on the North Slope

The North Slope has undergone tremendous economic change since the advent of the oil developments centered at Prudhoe Bay in the late 1960's. The North Slope Borough (NSB) was formed in the early 1970's. Its formation enabled the permanent Inupiat residents of the North Slope to levy a tax on the industrial improvements at Prudhoe Bay. The taxes have financed considerable public facilities including schools and sewer and water facilities in the NSB. They have also financed many jobs with the North Slope Borough thus expanding job opportunity that otherwise would not have been there. Since the beginning of production at Prudhoe Bay in 1978 the long range forecast was for a decline in production within 20 years. The NSB has been aware of the potential decline in property tax revenues on the oil industry infrastructure for some time since its inception.

Running counter to this decline may be extraction of gas from the North Slope to provide increasing demand in the Lower 48 states. In the year 2000 private companies initiated feasibility studies for construction of pipelines from Prudhoe Bay to Calgary, which would connect with the pipeline system in the Lower 48. This would require substantial industrial infrastructure, which forms the tax base for the NSB. The extent to which these proposals would stabilize the NSB tax base is not certain. Even though the gas development proposals are in the offing, the tax revenue future for the NSB is uncertain and could have significant adverse effects on its economy and residents. This should issue should be studied.

Environmental Data Management

The MMS environmental database for the Alaska OCS Region needs to be enhanced. The database is important for the evaluation and monitoring of new oil- and gas-development projects, analyzing seafloor and biological information in these areas, and more timely completion of environmental analysis required under the National Environmental and Policy Act. The MMS report, *Report to the Offshore Environmental Management, Development of a Corporate Environmental Database* (1997), outlines long term data management activities.

Natural Gas Pipeline

One of the routes for the natural gas pipeline being considered by industry is from Prudhoe Bay, northward to about 4 miles offshore, eastward 300 miles, then southward along the Mackenzie River, and finishing at Calgary, Alberta. Most of the offshore portion would be on the US OCS. (The other major alternative is onshore.) If the preferred route is on the OCS, MMS would be responsible for issuing permits. A buried gas pipeline (as opposed to an oil pipeline) under the seafloor of the Beaufort Sea is a

new issue. If the Beaufort OCS is the preferred route, the Alaska Region may need to conduct environmental studies on a variety of environmental issues.

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